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Academics & Industry

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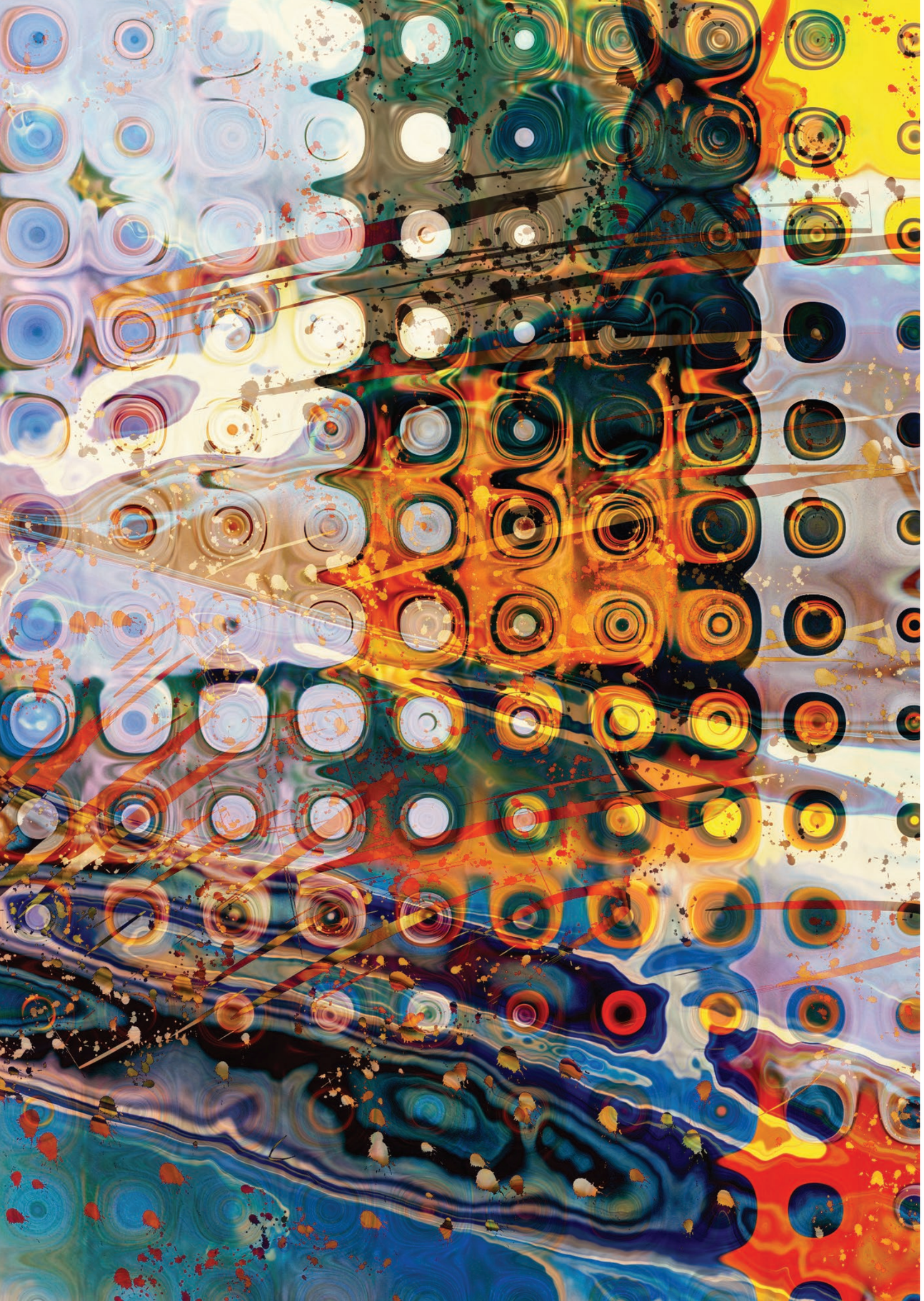

Executive summary

With the economic outlook for the UK looking positive, organisations such as the British Chambers of Commerce and the OECD have raised their growth forecasts for the year. The economy appears to be in recovery and this report identifies how important digital clusters will be to its continued success.

In the preliminary findings of his Review on Universities and Growth, in July 2013, Sir Andrew Witty emphasised the importance of clusters in driving regional growth policy. The 2013 National Institute for Economic and Social Research (NIESR) report, measuring the UK's Digital Economy with Big Data, found that the digital economy is not only larger than the Government estimates but is also found in highly concentrated clusters, like the one in Brighton. These digital clusters are especially important to the economy because they tend to feed the growth of other sectors.

The size of the UK creative economy is now estimated as greater than the construction, manufacturing and financial services sectors. With this in mind, the two year Brighton Fuse project, along with this report, seek to provide deeper understanding of some of the drivers shaping its size and development. Some of the key questions we set out to investigate included:

- How creativity links to entrepreneurship and economic growth?
- What combination of skills, knowledge and networks is essential to the thriving creative digital business?
- What role does education and academic research play in a successful digital cluster?
- How and when should government intervene to promote the conditions required for clusters to generate extraordinary high growth?

'Fused' businesses are driving extraordinary growth

Steve Jobs, the late co-founder of Apple, liked to describe his company as existing "at the intersection of technology and liberal arts". Jobs himself grew up in Mountain View, California, the Silicon Valley city that is today the home of technology innovators such as Google and Salesforce. However, this integration of technology and creativity is being echoed closer to home. Some 40 miles south of London, Brighton has developed its own cluster of creative and digital businesses, known to some as Silicon Beach. The research identifies a new category of high growth firms within this cluster, that are 'fusing' and 'superfusing' to create an extraordinary competitive edge. Fused businesses are those that combine creative art and design skills with technology expertise. Among Brighton's cluster, two thirds are considered fused and believe in the competitive advantage of combining diverse skills and knowledge.

Fused and superfused classes of firm are clearly linked to increased growth. While Brighton's creative, design and IT firms grew faster than the local economy and more than 10 times faster than the British economy as a whole, fused business grew at more than twice that speed and superfused firms grew faster still. This report will focus on exploring the growth and exceptional advantages companies enjoy when they draw on skills from mixed disciplines.

Creating the conditions for success – an interdisciplinary approach

For a cluster to thrive it needs to be fed by the right local resources. The Brighton technology cluster, for example, has drawn on the supply of creative entrepreneurs, a skilled workforce, networking systems for sharing knowledge and, as this is largely a business-to-business cluster, access to appropriate clients. As this report will show, there is scope for still greater success when different skills and backgrounds can be 'fused'.

The links between Brighton's technology cluster and the Universities of Brighton and Sussex are important, and growing. Graduates might choose to stay on in the area to join a business or even to found one. However, unlike Stanford graduates, they are not the lifeblood of the cluster. In fact, it is the dynamic approach to an interdisciplinary workforce that is driving Brighton businesses to succeed through market adaptation and continuous evolution. One of the key findings of this report is the prominence of arts and humanities skills in the cluster, with 48% of Brighton entrepreneurs being arts, design, and humanities graduates.

The findings emphasise the importance of the arts and humanities to a sector that has often seen them as 'soft' subjects. By integrating these creative arts with science, technology, engineering and mathematic (STEM) skills, businesses are pursuing a powerful growth agenda.

However, integrating disciplines is not easy. In many ways, fused and superfused companies have become successful against the odds. Our educational systems favour specialisation, separating arts and science students as if they were volatile chemicals. Many businesses are still structured around isolated disciplines and cultures. Often, people even socialise with others in the same specialism. It is also worth noting that businesses which buck the trend find themselves outside existing Standard Industry Classification Codes.

These challenges point to the need for Government and industry to encourage integrating disciplines to help fused and superfused businesses to develop. This will not be a simple task, it requires effort, persistence and needs to be led and encouraged by the right advocates and talent. There is a task here not only for businesses but also for educators and policy makers. Brighton Fuse shows that the rewards are there for the taking.

Introduction

1. At the coalface of the creative economy

This report presents the findings of a two-year research project about a cluster of Creative Digital and IT (CDIT) companies in Brighton and Hove (referred to as Brighton in this report), in the south of England.

It is based on a survey of almost 500 firms and interviews with 77 local entrepreneurs, and provides a picture of recent developments in the creative economy as it is being transformed by new digital technologies. The report describes the economic opportunities being generated by new digital technologies, the challenges firms face in exploiting them, and the business strategies that can help creative and digital businesses grow and prosper. We believe that many of its implications – regarding the new sources of competitive advantage in the creative digital economy, and the role for policy in supporting the creative and digital industries are widely relevant across the UK and also internationally.

The creative and digital industries are interesting because of their importance to economic growth and innovation in the UK.[1] Recent research by Nesta has shown the creative industries employed 1.35 million people (4.7% of the total workforce) in 2011, and contributed £69.9 billion to the UK economy.[2] The creative economy, which also includes people working in creative occupations outside the creative industries, comprised 9.7% of the UK economy – more than construction, advanced manufacturing, or financial services. Its workforce grew at four times the speed of the UK economy overall between 2004 and 2010.

This rapid growth in economically uncertain times is partly a consequence of the explosion in the number of devices and platforms that can be used for accessing creative goods and content. Between 2004 and 2011, consumption of creative goods in Europe grew by 20% - and by 30% in the UK.[3] European consumers now spend 60% of their leisure time consuming media content.[4] More competition and consumer demand for well-designed and beautiful products have also increased the importance of creative services like advertising or design, which business clients purchase to help their products stand out in the market and increase consumer loyalty.[5]

While digitisation has created many opportunities for the creative industries it also has the potential to generate disruption. Recently, incumbents have

faced increased competition from new entrants, while intellectual property infringement has impacted on business models and pricing.[6] Creative firms have had to upgrade the digital skills of their workforce, build up their technological capabilities, and develop new business models more suitable for a world where the marginal cost of reproducing and distributing digitised information approaches zero.

In this context, 'fusion' –the combination of creative arts and design (on the one hand) and technology (on the other) – appears as a critical driver of innovation and growth in the creative digital economy. This hypothesis, set out in the CIHE Fuse report, is at the heart of this study.[7] Its potential implications are substantial on a number of fronts – including the way we define and measure the creative and digital industries, education and skills, the interface between universities and industry, business support, and local economic development.

The importance of fusion was echoed in Eric Schmidt's mention of the 'polymath' in his famous MacTaggart lecture at the 2011 Edinburgh TV Festival. There, he claimed that a limitation of the UK education system was that "both sides [humanities and STEM] seem to denigrate the other – to use what I'm told is the local vernacular, you're either a 'luvvy' or a 'boffin' ".[8] Similarly, the late Steve Jobs described how, "It's in Apple's DNA that technology alone is not enough — it's technology married with liberal arts, married with the humanities, that yields us the result that makes our heart sing".

This interdisciplinary effect we call fusion has been central to some of the creative industries for quite some time. For example, in computer generated animation, post production, or video games development, artists and designers create characters and worlds to watch, interact and engage with. This interaction and the seamless, film-like motion of these virtual environments are attributable to the software engineering and content management skills of computing. Similarly, the development of design skills for the web necessitates the continuous upgrading of skills to include the production of designed content that fits with the interfaces of the internet. Audio-visual productions have increasingly expanded to digital platforms.

What is perhaps more surprising is that this fusion is becoming prevalent throughout other sectors in the Creative-Digital-IT economy. For example, digital marketing today combines not only the search engine optimisation and data analytics needed to understand contemporary buying behaviour, but also an understanding of the sensibilities of what consumers like, desire and aspire to. This means appreciation of social tendencies and segmentation, genre and branding preferences, and a sense of how motifs and symbols connect. These sensibilities we suggest are derived from the arts and humanities. It is through this knowledge that social media campaigns become viral as people enjoy, share, and comment on the video, copywriting and iconography of digital content. We have found that when this knowledge is combined with current technological knowhow, the performance of the firm becomes 'superfused', achieving superior levels of innovation and growth.

2. Clustering and the geography of creativity

We are also interested in Brighton as an example of a creative and digital cluster. Clusters - geographical agglomerations of firms that compete, collaborate, innovate and grow together - have for long been a 'holy grail' for policymakers inspired by the successes of a small number of exemplars such as Silicon Valley.[11] In spite of many disappointments, cluster policy remains very much on the agenda, as we see in recent and substantial government investments in 'East London Tech City'.[12] What does the experience of Brighton tell us about the scope and tools for cluster catalysis and support?

Another framework connecting creativity, clustering and growth is the popular 'creative cities' hypothesis developed by US economist Richard Florida, who argues 'soft' local factors like culture and diversity attract high human capital individuals and contribute to growth.[13] We explore whether this hypothesis is supported by the data from the Brighton cluster.

3. About this project

The Arts and Humanities Research Council funded the research underpinning this report with a broad remit to map, measure, and enhance the CDIT cluster and to operationalise the CDIT categorisation. The project itself was an example of a fusion initiative. The research was conducted by the Universities of Brighton and Sussex, including the Business School, the Faculty of Arts, and the Science Policy Research Unit (SPRU). Moreover, the research was also co-produced with Wired Sussex and the National Council for Universities and Business (formerly CIHE) and so had intimate access to business. Wired Sussex, with a membership of more than 2000 of CDIT companies and freelancers, was fully involved in the framing of the both the quantitative and qualitative research, the design of the questionnaire and its promotion across the cluster, and the development of the policy recommendations. There are also practical initiatives to address barriers to growth in the cluster that follow from the research. These are not covered extensively in this research report, but we do outline two Action Research case studies led by Wired Sussex engaged at different stages of the educational journey to understand and develop learning models appropriate to supporting the long-term growth of the sector. These were the Brighton schools/Cherokee Nation digital cultural exchange, and the Brighton Institute of Modern Music/ FuseBox study.

Data and method

1. Introduction

We selected the city of Brighton as the site for the research. Located on the English south coast, Brighton has been identified as one of Britain's 'creative hotspots'[14] or 'Super Cities'[15]. Wedged between the South Downs national park and the sea, it has been a popular tourist destination since the late 18th century, being just over 50 miles from London. It has two popular universities – Brighton and Sussex – and retains a high proportion of students after graduation. The University of Brighton has a strong tradition in art and design, with an institutional history reaching back to Brighton School of Art in 1859, ensuring a steady supply of arts graduates. The University of Sussex has a global reputation in the humanities and informatics. The first Brighton Festival took place in 1967, and has grown into England's largest annual arts festival, inspiring several other festivals including Artists Open Houses, CineCity, the Great Escape, the Brighton Photo Biennial and most recently the Brighton Digital Festival.

In addition to its vibrant cultural scene, since the 1990s Brighton has been home to a proliferation of start-up companies in digital media and design services, many of which affiliate with local associations. The largest of these is the membership and brokerage organisation, Wired Sussex[16]. In 2008 Brighton was home to one of the highest concentration of 'bohemians' in the UK (as drawn from the 2001 census data)[17].

We decided to do a survey to collect the data for this research. The reason is there was no readily available group of Standard Industrial Classification (SIC) codes capturing the creative and digital industries we could use to retrieve data from official firm datasets like the Business Register Employment Survey (BRES), the Annual Business Survey (ABS), or the UK Innovation Survey. Even if we could have used existing materials, those datasets would not have had information at a high level of resolution about important questions like how Brighton CDIT firms combine arts and technology to innovate and grow, or the drivers for their clustering.

The first and perhaps most challenging issue for us, was to bind the 'Creative, Digital, and IT' sector in to select the targets for our survey. We decided to ground this classification on the productive activities being carried out by firms in the cluster, rather than necessary (if contested) 'top down' definitions based on standard industrial classification codes.

Our approach started with the Wired Sussex membership (i.e. companies and freelancers operating in the digital, media and technology sector in Sussex), which we assumed should be a likely location for CDIT firms. As a result, 783 Wired Sussex members from Brighton were identified and included in the sampling frame. To increase our coverage we conducted a search on commercial firm database (Bureau Van Dijk's FAME) for Brighton firms sharing SIC codes with the Wired Sussex membership, as well as firms with SIC codes included in the DCMS 2010 definition.

This process resulted in a list of more than 7,500 companies which we hand-checked to exclude unsuitable companies, these included companies that were not operating anymore, companies that had been acquired or moved out of Brighton, companies registered in Brighton but operating somewhere else and companies evidently not working in creative and digital activity. We also included two screening questions in the survey. We ended with a sampling frame of 1,495 local firms in the creative and digital industries comprising 783 members of Wired Sussex and 712 non-members to whom we targeted our survey.

2. Questionnaire design

We drew on existing questionnaires - including the UK Innovation Survey, Intangible Asset Survey, Small Business Survey, Kauffman Firm Survey and the Nesta 'Rise of the Datavores' survey - to produce a questionnaire addressing our research questions.

The questionnaire targeted CEOs, MDs, founders or senior personnel of the firms, and covered a variety of topics. It included questions about the firm such as sector, markets and technologies, business growth and size, characteristics of its workforce, barriers to growth, networking and relationship with universities. It also explored questions about the respondent, reasons for moving to Brighton, qualification and reasons for starting a business -in the case of founders.

We piloted the questionnaire to make it sure it worked. This included qualitative interviews with a small number of practitioners, a 'cognitive' test with a group of Brighton entrepreneurs whose feedback helped us identify problematic areas and potential sources of confusion, and finally, a test with CDIT firms in Worthing and Eastbourne. The final version of the questionnaire included 50 questions and took up to an average of 30 minutes to complete.

3. Questionnaire delivery

The survey was completed in two waves. The first wave was implemented online and using paper questionnaires during summer 2012. The second

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Table 1: Comparison between DCMS Creative Industries

	% firms	% turnover	% employees
DCMS 2011 Creative Industries (excluding Software/Electronic Publishing)	38.7%	31.3%	30.9%
Software/Electronic Publishing (included in DCMS 2010)	13.8%	29.3%	26.1%
Not captured by DCMS	47.6%	39.4%	43.1%
Total CDIT firms in our sample	100.0%	100.0%	100.0%

(Based on 429 firms for which we could find a SIC code)

One of the first results arising from the data collection shows some serious divergences between the size of the CDIT sector in Brighton, if one uses the operational definition of Creative Industries published by DCMS in December 2011 and the 'snowballing' approach followed in this study.

The DCMS 2011 Creative Industries classification would in fact account for only 38.7% of the firms in our sample (31.3% by employment). The SIC codes related with 'Software/Electronic Publishing', which were included in the DCMS 2010 classification (62.01/2 and 62.02), would account for an additional 13.8% of the firms (29.3% by turnover). However, even then, these SIC codes would still exclude 47.6% of the CDIT firms in our sample, which would underestimate the total size of the cluster by 39.4% in terms of turnover and 43.1% in terms of employment.

In particular, the SIC code not captured by the DCMS classification, which is most frequently represented in our sample is 62.09 (Other information technology and computer service activities). That codes 62.01/2, 62.02 and 62.09 should be included in the CDIT classifications is consistent with the results in Bakhshi, Freeman and Higgs (2013) mapping of the creative industries at the UK level.[18] This finding underscores the importance of digital industries in the cluster and the importance of having the right operational definition for the creative and digital industries, an issue we return to in the conclusions.

wave used an abridged, but otherwise comparable, version of the questionnaire via telephone, conducted in September 2012 by a specialised research agency.

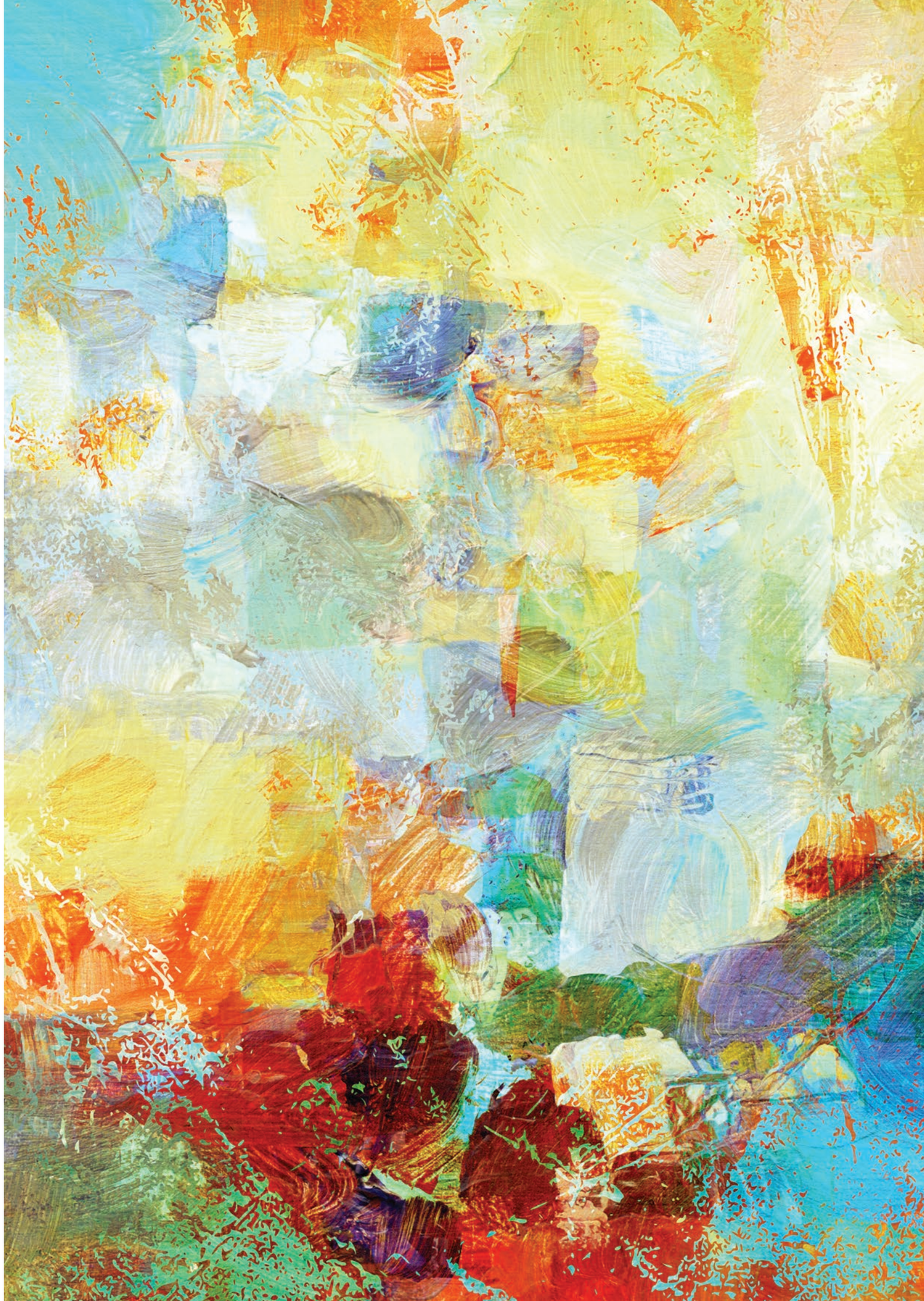
The final dataset consists of 501 responses (33.5% response rate), with 485 valid observations (32.4% response rate). The sectoral distribution of respondents to the survey by SIC code is broadly in line with the sectoral distribution in our sampling frame.

4. Qualitative data collection

The qualitative research followed four themes: innovation strategy; festivals, networking and events; slash-slash careers; and lifestyle business. Some of these themes were tightly integrated with categories in the survey questionnaire, while others were more exploratory questions requiring interviews and observation. We followed an inductive 'grounded theory' approach to data collection and analysis whereby research attention is continually modified and, at times, redirected according to the emerging findings. This means that some ideas and propositions are found not to be significant in the interviews and observations, perhaps contrary to views by theorists and commentators. The research then turns attention to the behaviours and outcomes that do appear to be important in explaining the dynamics of the subject under study.

We completed 77 interviews with respondents ranging from managing directors of firms to key festival co-ordinators, artists, programmers, freelancers, and academics. These interviews were conducted face to face and were between 1 and 2 hours in duration. They were recorded and transcribed, before the researchers highlighted representative quotes reflecting the emerging categories of data.

We also conducted observational research of certain events in the festivals, networking meet-ups and meetings, and work in organisations such as Wired Sussex. We made notes on these observations and analysed them as we did the interviews. The quantitative survey results also fed into the 'theoretical sampling' of the qualitative research. For example, we found some high growth sectors in the survey results we had not anticipated and chose to pursue these with qualitative interviews to understand better what was occurring. Similarly some survey results were puzzling, for example on barriers to growth, and so we directed some qualitative questions towards these issues.



The shape and size of the Brighton cluster

How big is the Brighton CDIT cluster? In what sectors do its firms operate, how big are they, and how fast have they grown recently? What are their levels of fusion? We address all these questions in this section.

1. An economically significant, fast growing cluster

Overall, the firms in our sample employed 3,162 people in 2011 and generated nearly a quarter of a billion pounds in sales (£231m). On average, firms in the sample grew 14.7% between 2010 and 2011. The median is still a respectable 3.8%. These figures are very high, considering that GDP in volume terms in the UK increased by 0.7% in the same period[19].

We have tried to triangulate these survey numbers with official data from the government's Business Register Employment Survey (BRES), available from the Office for National Statistics.[20] We have done so for the 2010-2011 period using a definition of CDIT which focuses on the sectors identified as creative by DCMS in its latest consultation, plus the SIC code 62.09 (Other information technology and computer service activities) which has a substantial weight in the cluster.

This additional analysis reveals that in 2011 there were 6,500 employees in the relevant SIC codes in Brighton. It is important to note, the sampling frame for BRES only includes firms registered for Value Added Tax (VAT) or Pay As You Earn (PAYE) schemes and, as such, may miss some micro-business captured in the Fuse firm survey. Moreover, around a third of the firms surveyed in the Fuse research are classified in SIC codes outside the definition we have used in our analysis of BRES. Having said this, our analysis of BRES data appears to confirm the fast growth rates registered in the Fuse survey. It also allows us to compare growth in Brighton with other parts of the UK: between 2010 and 2011, employees in these CDIT SIC codes grew by 13%. This is four times faster than Brighton's economy overall, twice as fast as the same sectors in the South East, and more than ten times faster than Britain overall (see figure 1).

Figure 1: Employee growth in creative digital SIC codes in Brighton, the South East and Great Britain (2010-2011)

Source: BRES (2013)

2. A cluster of SMEs and micro-businesses, with many young firms

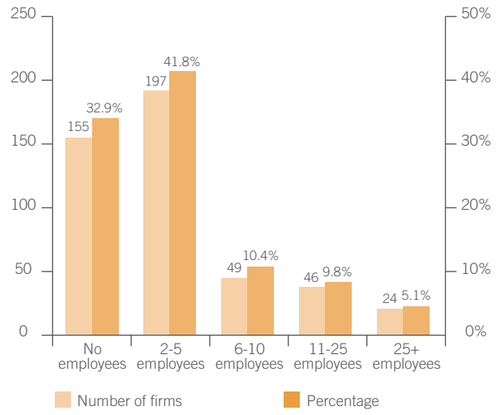
The average firm employs approximately 7 people. The median firm employs 2 people. Only 2.3% of the sample would qualify as 'medium sized', and less than 1% has more than 100 employees. Around 33% of firms are 'working owners/sole traders' (i.e. they have no employees beyond the owner). Firms with more than 10 employees comprise less than 15% of the sample, but employ 65% of all employees and generate almost 75% of all sales. Meanwhile, working owners comprise 33% of all firms, but less than 5% of employment and 3% of sales.

The growth rates we identified above do not appear to point to the prevalence of micro-businesses in the sample. If anything, firms with 6 to 10 employees, and more than 25, grew their sales faster than the sample overall (mean growth 22.3%, median growth of 8.8%).

Half of the firms in the sample started operating in the last 10 years and a quarter are younger than 5 years (our definition of a 'start up'.)

Young firms in our sample grow faster than their older counterparts. Start ups, defined here as firms younger than 5 years old, have a mean growth of 33.3% (about 4 times that of non start ups) and a median growth of 18.8% (about 5 times that of non-start-ups).

Figure 2: Size distribution



3. A diverse and heterogeneous cluster

We have found a diverse range of sectors in the sample. We obtained this classification by asking firms to describe their main activity and to choose one of the official sectors. Then we manually hand-checked and coded the self descriptions and triangulated these results with the official sector chosen by the respondents. These include service providers such as digital marketing and creative digital agencies, which offer combinations of services such as search engine optimisation, paid search advice, web design, digital marketing strategy and increasingly social media. These firms work on behalf of clients helping them to maximise their profile, engagement and sales through e-commerce on the internet. Web portal firms host sites and technology platforms through which transactions are made, usually on behalf of other firms but taking a share of the sales. These range from rather passive offerings that simply offer a competitive price afforded by an advantageous business model, to highly customised services that combine multiple items and may involve some live consultancy, for example organising a multiple destination trip or a complex leisure experience like a stag night.

Content companies produce digital material to be viewed or interacted with on mobile devices, video games consoles, the web or interactive television. Content may involve computer generated animated video, conventional film-making later edited digitally, online advertising banners, interactive interfaces, education and training applications, or presentations. Arts organisations produce artistic works often subsidised by grants, sponsorship and donations, and bring these works to audiences for engagement and sales in exhibitions, performances, and co-ordinated events such as festivals. Increasingly arts organisations are distributing their works through digital channels.

The largest sector in the sample (in terms of number of businesses) is 'content' with 22.5% of respondents, followed by design services, digital agencies and digital technologies. There is variation in the size and age of firms. Design services, arts organisations and crafts are composed of relatively small firms, while marketing services, digital technologies, and web portals contain relatively large firms. The digital technologies sector is the biggest employer – and has the largest sales, followed by digital agencies, content companies and marketing services.

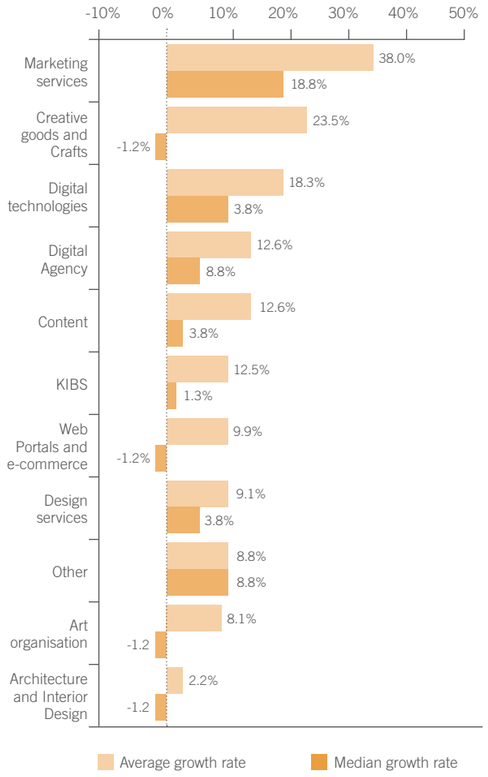
About a third of marketing services firms are start-ups (younger than 5 years), compared to only 4% of arts organisations.

Table 2: Sector, sales and employment distribution

Sector	% all firms	% all sales	% all employment
Architecture and interior design	3.1%	1.4%	2.1%
Arts organisation	4.8%	1.5%	2.0%
Content	22.5%	15%	15.9%
Creative goods and crafts	4.1%	2.4%	1.8%
Design services	16.5%	6.9%	8.3%
Digital agency	13.6%	19.5%	14.9%
Digital technologies	13.4%	25.1%	27.6%
Knowledge Intensive Business Services (KIBS)	9.1%	8.0%	9.2%
Marketing services	8.7%	12.6%	12.7%
Web portals and e-commerce	2.7%	7.3%	4.6%
Other	1.4%	0.2%	0.7%
Total	100%	100%	100%

Economic processes of 'creative destruction' and structural change mean technological progress reallocates employment from declining traditional sectors to emerging sectors. Even among these emerging sectors there may be some that grow faster than others. It comes as no surprise, therefore, that there are also striking differences in growth across sectors. On average, the fastest growing sector is marketing, followed surprisingly by crafts, digital technologies, content and digital agencies. Looking at the median in order to deal with extreme observations that may skew the average growth rates by sector reveals a number of sectors where more than half of firms have experienced a decline in sales between 2010 and 2011. They are: architecture, arts organisations, creative goods and crafts and surprisingly web portals. Marketing services, other activities, and digital agencies have the highest median growth rates – more than half of marketing firms grew by 18.8% or faster. More than half of digital agencies grew by 8.8% or faster.

Figure 3: Average and median growth rates by sector



4. Fast growing firms in the Brighton cluster

The OECD defines high growth firms as those with employee or turnover growth of more than 20% over three years, and with more than 10 employees in the first year. We have drawn on that definition to identify potential high growth firms in our sample, noting we only have growth data for one year and also used a less restrictive one focusing on firms that, in 2011, had five employees or more.

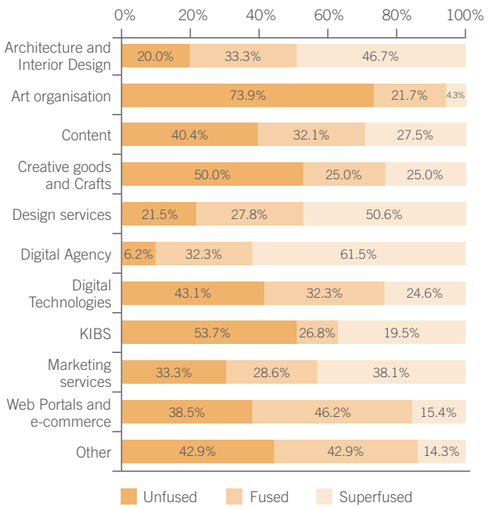
Overall, 15.2% of all firms with more than 5 employees in 2010, and 16.7% of all with more than 10, experienced growth rates above 20% between 2010 and 2011. That is, they were on the way to 'being high growth' in a 'vital 6% way'. This references a NESTA report which found it is a "vital 6%" of firms that play a disproportionately large role in economic growth and job creation.[21]

High growth firms are more prevalent (in absolute, as well as relative terms, i.e. proportion of all 'eligible' ones) in digital technologies, digital agencies, marketing services, KIBS, and design services. By comparison, in content we only observe a high growth firm with more than 5 employees in 2010 (out of 15 firms) and none out of those with more than 10.

5. A fused cluster

Combinations of diverse skills and knowledge sources can be a source of competitive advantage to new business ventures.[22] Two thirds of the firms in the Brighton cluster say they combine creative design and technology in their work – half of these (i.e. a third of our sample) agree with this strongly. We refer to them as the 'superfused' firms. We see fusion across all sectors in our sample, but some sectors appear to be more fused than others – for example, 94% of digital agencies, 80% of architecture and interior design firms, 78% of design services, and 67% of marketing services are fused. By comparison, only a quarter of arts organisations show any level of fusion, and only 50% or less of firms in creative goods & crafts and KIBS show any level of fusion.

Figure 4: Fusion overall and by sector



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There are almost twice as many start ups (firms younger than five years) in the superfused category (35%) than in the unfused one (18%). We have found cases of new firms being created to take advantage of the newer trends of fused business. Whereas, in the 1990s and early 2000s, entrepreneurs may start firms dependent on a more restricted set of capabilities, such as search engine optimisation or web design, in the later 2000s new firms have a broader offer of value connecting across services.

Fused firms in Brighton, bringing together arts and humanities and Science, Technology, Engineering and Mathematics (STEM) graduates, carry out coding as well as content production, rely on external collaborators for technology and creative inputs, and are reliant on both technological and creative expertise to succeed in their markets. Many of these have always been reliant on this interdisciplinary mix, for example in content sectors. Yet even in these the fusion becomes deeper as artists are increasingly expected to have some basic coding skills and programmers need to work closely with them, as well as with producers or project managers. In sectors such as digital marketing and creative digital agencies, this array of skills and capabilities has been added over time. Typically firms began by offering web design or search engine optimisation services to clients trying to make a presence on the web. Over time they found it made sense to offer both these services, which entailed an interdisciplinary mix and workforce. In more recent years further services have been added, such as paid search and social media. These newer capabilities vary as to the balance of creative, technical and managerial fusion but increasingly they are dependent on a mix, rather than simply a single knowledge base.

Plug-In Media, for example, is a digital media production company with a workforce split roughly into a third between art, design and animation; programming; and production. However, all are working in interdisciplinary project teams as Juliet Tzabar, the Managing Director explains:

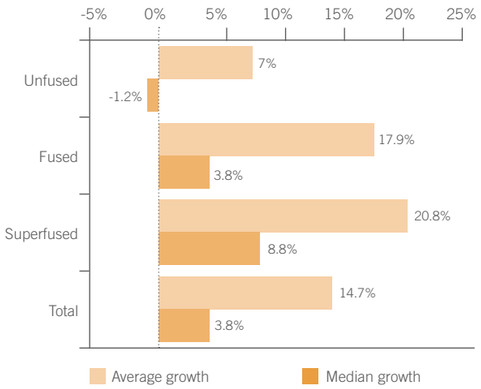
"A lot of our development systems and environment means the artists are putting the graphics they're working on into the same system as the developers. So, if an artist changes a graphic it's immediately reflected in the build the developer is doing through a conversioning system. It's very closely integrated…everyone's mixed up… I don't think we've ever really wanted to pursue a kind of developer system on one floor and artists on another, it just never really seemed to make sense from what we do…Our projects are very creative, but that creativity is always really under-pinned by technology and we have to evolve the creative vision side by side with what the tech will do." (Interview, 24/07/2013)

Plug-In Media has won BAFTA awards and nominations for its games and interactive media specialising in the children's market, which range cross-platform from television to mobile devices. It has steered through these business models and had to adopt new technologies and standards, but fusion has always characterised its mode of working and its strategy.

Fusion is also reflected in the leadership of CDIT firms. Juliet herself is an arts graduate, having done English literature and then theatre design. She later learned production skills in freelance television and trained in multimedia design management. This is not uncommon: Rosie Freshwater, Managing Director of Leapfrogg, the digital marketing agency also studied, drama with theatre as her first degree before becoming drawn to digital business and management. We have found some 48% of CDIT entrepreneurs are arts, design and humanities graduates, many of whom bring their aesthetic sensibilities to the management of technology-oriented firms. The point is to be cognisant of the range of skills in order to effect business growth. Mike Hollingbery, CEO of BozBoz, a creative digital agency:

"I've always been very keen not to be a tech guy, or a designer, or like a host. I like all of those things and actually they're all part of an ecosystem. Whatever your target is, to entice your consumer to do something or to give them a great user experience or whatever it might be, any one of those technological or design things can be the hole in the boat that makes it sink. So something we've always been quite good at is covering the bases of all of those things, and that's helped us, I think, grow quite quickly."(Interview, 02/08/2013)

Figure 5: Growth rates by fusion



Fusion is clearly connected to growth. The average fused/superfused firm grows at more than twice the speed of 'unfused' firms. While the median unfused firm is declining in sales (that is, having a growth rate far below the sample median), the median superfused firm is growing by 8.8%. We observed earlier that new entrants may have to combine knowledge sources in order to succeed in

their dynamic industries. We suspect old firms that remain 'unfused' may face decline that could be offset if they were to open up to diverse knowledge bases. This might not be an obvious strategy to old firms but, considering that fusion is associated with growth, such a response may have a large payoff.

In broad terms, higher levels of fusion within industries appear to be connected to faster average and median growth rates. We have also found that the connection between fusion and growth remains visible and significant after we control for firm age, size and sector.

The average firm worked with more than 7 freelancers. The average working owner (firm with no employees) worked with more than 5 freelancers (the median with two). Almost 80% of firms in the sample worked with freelancers between 2010 and 2011. Arts organisations use more freelancers (a median of 17 compared to a median of 3 for the cluster overall).

Lambent Productions is an award winning independent television production company that also works on digital platforms. Here the model is heavily reliant on freelancers, as the company ranges from 6 people to as many as 30, depending on current projects. These include directors, researchers, assistant producers, editors, and camera people to add to a core staff of production, financial and IP management, distribution and public relations. Lambent organises occasional idea generation and development sessions in which freelancers are invited to share their ideas and Lambent helps them to develop these into finished pitches for new programmes. If the outcome is successful they share the production fee and IP. Lambent has no shortage of its own ideas, but this ready access to a pool of freelancers helps to ensure a variety of content across the portfolio.

Firms active in other sectors use freelancers for more specific roles which are in scarce supply. For example, Leapfrogg needs paid search specialists - requiring analytical and mathematical skills, and has found very few locally and needs to go further to London for these freelancers. Plug-In Media finds it hard to find freelance producers, partly because the freelance pool tends to have producers with more experience of large console games projects, while Plug-In works with mobile platforms and smaller budget projects. The dynamics of digital sectors often mean the labour market lags behind the needs of industries. While there is a critical mass in the Brighton cluster, there are skills that are in short supply, which we explain in the section on barriers to growth later.

Trade and innovation in the Brighton cluster

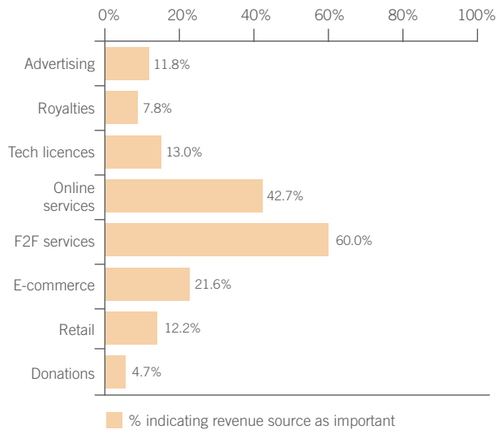
The Brighton cluster is growing rapidly. What commercial activities are driving this growth? How does the cluster generate its income, and what is the role of innovation in all of this?

1. Brighton is a B2B services cluster

60% of firms in our sample identify face-to-face services as an important source of revenue. This is followed by online services (43%), and e-commerce (selling products online: 22%). The low importance of royalties is notable – only 8% of respondents identify royalties as an important source of revenue.

There is variation in sources of revenue across sectors. Technology licenses are much more important for digital technology companies, while marketing services use advertising more. Online services and e-commerce are dominant for web portals. Creative goods and crafts use retail (60% identify this channel as important). Although royalties are more important in content companies (22% identify it as important), they are still below online and face-to-face services as a source of income for them.

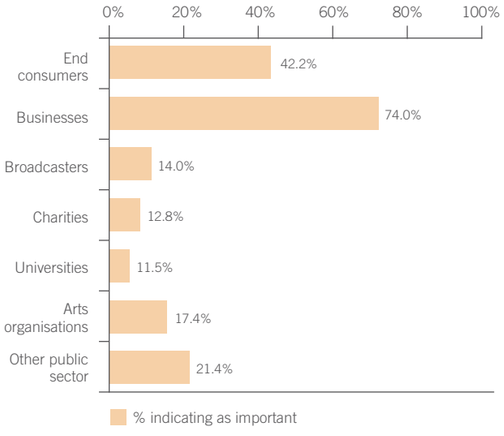
Figure 6: Sources of revenue in the Brighton cluster



Brighton is a B2B cluster. Almost three quarters of respondents (74%) identify businesses as their most important clients. End consumers are also important (42% identify them), particularly for arts organisations, content companies, creative goods and crafts, and KIBS.

Other than this, there is variation across sectors. Broadcasters are important for content companies (a third identifies them as important) and digital technology companies (15%). Digital tech companies very rarely work for arts organisations. Meanwhile, arts organisations tend to work more with other arts organisations and the public sector.

Figure 7: Types of client for Brighton firms



2. Business models: Value is subtle and differentiated

Firms' choices of business models are crucial to how they survive and grow. The survey results show the cluster is largely a business-to-business service economy of small and very small firms. This type of commerce is often characterised as disadvantageous for small firms doing work-for-hire for bigger and more powerful clients, while those clients enjoy the lion's share of the rewards as owners of the intellectual property. The challenge for the small firm, so the argument goes, is to move from being a service provider to developing its own products and IP to generate revenues from sales and licences without effort. To a large extent this view inherits many of the assumptions of the older creative industry business models, before digitisation and the internet. Our research has shown there are variations of work-for-hire and other business models to be found in the cluster, even if traditional IP rights-based revenues are few in number.

Retainer models

The retainer model is a typical service model where the client will pay a set amount every month for a specified period of time, often a year. Servicing firms prefer this arrangement because it allows for innovation to be budgeted for. Will McInnes, the Managing Director of social media agency Nixon McInnes stresses the importance of "thinking" and "tinkering" (Interview, 29/02/2012) in developing new technology and offerings, including early stage scanning of external trends in the industry. The retainer model allows for this innovative work to be captured and paid for as a legitimate cost of the service provided. The difficulty and the challenge is to be extremely adept at using that time, since many competitors will not be charging for such innovation work and it may be perceived as a premium by the client comparing the bids.

There are variants in how these retainer contracts are configured. Many clients like the regularity of the 'flat retainer' model described above, but it may be that work and payments is more 'lumpy'. For example, Leapfrogg the digital marketing agency, will often "front-end" retainer contracts with clients, where the first phase will be an intensive 'Insight and Strategy' review on the clients media and marketing, with a delivery of recommended options for how the client should manage their spend. Given agreement, Leapfrogg will then arrange the work over the year based on the options. The initial insight and strategy phase may also be contracted as a project, with a view to transferring to a retainer.

Leapfrogg manages the need for 'thinking and tinkering' by accounting for 5.5 hours working on client projects per day. The remainder is spent by individuals on researching the company's specialised sector, exploring the market, and searching for opportunities, as well as writing blogs and developing and marketing the company's thinking. This time and activity is crucial though difficult to protect at times of pressure, but it is easier to manage over planned periods of retainer model financing.

iCrossing, the leading digital marketing company, experimented while on a retainer basis with the sex shop chain Ann Summers. Paul Doleman, CEO, explains:

"One of the paid search analysts had an idea. He said 'why don't we pick up on current events, sports events, news events, nothing too bad taste, but something that's in the news headlines, and hijack it and just throw a media bid on search terms that are relevant to it. When you do get a little bit of freedom to experiment through the retainer model you can do really cool things."(Interview, 30/07/2013).

iCrossing bought search terms for Ann Summers around the Government budget announcement of 2010. They were very low cost and not typically search terms associated with paid advertising results. The adverts as a result got very high visibility with appropriately cheeky copy like, "There is no recession in desire". The website received over 4000 more visits that afternoon, and national newspaper and social networks picked up the story, raising awareness. Retainer models allow the time for this type of counter-intuitive thinking and willingness to risk unconventional strategies. Paul Doleman explains:

"You almost get pre-agreement that there's my R&D budget, in a way, out of my media. I'm still going to deliver everything you want overall, but I'm pretty confident I can do that and still save £50,000 throughout the year to try a few things in mobile channels, to try some augmented reality, to try some location based marketing, to try a little bit of craziness off-piste, sort of keyword bidding in media, and you start to do other things." (Interview, 30/07/2013).

Another variant is the retainer plus performance model. iCrossing frequently use this model working for retailers and travel brands online, where it may receive a low retainer for a short period but a percentage of the basket value of sales it has contributed to achieve, for example 3%. Yet another variant is a completely incentivised model with no retainer. But performance can

be measured in different ways according to the client's objectives. Rolls Royce wanted its brand to be loved, so iCrossing operationalized this by helping to increase their social media engagement. Payments to iCrossing were triggered by milestone numbers of Facebook followers added, but also by stronger indicators of engagement such as Facebook Likes, comments, and shares. It required a range of creative-digital skills to lure and grow this engagement from 10,000 followers to over 1,200,000.

Several of the other high growth businesses in the Brighton cluster similarly exploit these new forms of value. Brandwatch's successful product is used by leading global brands to track sentiment toward them on social media, allowing them to sense trends among consumers and the general public. The traditional media spend approach is increasingly seen as rudimentary in the online world with value and payments directed to new objectives and indicators.

Project models

The project form is used in all sectors and typically in those producing digital content, for media such as video games, animation, television, and smartphone/ tablet apps. Project-based firms dominate these sectors, which face the classical problems of trying to fund the substantial bidding work that may or may not be successful in securing new projects. The essentially unpredictable nature of project-based work presents difficulties in planning human resources to adequately staff projects, without overburdening the company in the event of a fallow period without winning work. CDIT firms contract freelancers to solve this problem, which is one reason why being in a cluster with a critical mass of talent is an important source of competitive advantage (see Section 5), even if the ideal talent is not always available for the ideal price. This may add unforeseen costs to projects.

The other problem is that projects are generally commissioned or contracted to deliver specific outcomes with an end date and the competitive process usually means there is little slack for the 'thinking and tinkering' necessary for innovation.

A Managing Director of a well-managed creative digital agency explained the problem with web design jobs:

"Websites are always project based. We lose money on those as many times as we make on them, the bigger the company gets." (Interview, 02/08/2013).

This is partly because of the tendency for creative 'creep' and unanticipated hours in completing new work, and also because of the increasing complexity of websites and the numbers of parties involved. A website serving a single event can typically involve multiple partners and advertisers whose brand and content are all integral. Each partner may ask for iterative rework, which generates unforeseen hours and escalating costs that may not be visible to the single contractor until a late stage in the project. These costs can quickly become multiples of the original budget, and since clients are not happy to pay this, it often means that compromises need to be agreed which eats into profits. These are classic problems for project-based organisations but digital technology exacerbates them because of the manipulability of tools and the increasing complexity of digital media artefacts. While console video games developers bemoaned interventions by publishers through the 1990s and 2000s, for example, now there are multiple parties for the small firm to engage in project business.

For all these reasons, small CDIT firms prefer to move clients from their preferred fixed price projects onto the retainer model, but this requires a certain size of client firm and a sophisticated awareness of the qualities and characteristics of digital media.

This type of larger sophisticated client may also contract CDIT service firms to use the project form for specific performance-related 'missions' that are experimenting and pushing emerging digital technologies and applications. One example is a digital media campaign with a simple defined objective like helping a retailer surpass an ambitious sales target. The client promises a large performance bonus to incentivise reaching the objective. Performance-incentivised payment is therefore another business model within the project form.

Online business models

An important source of new business is the online domain. This is a highly contested space where business models are not yet established but firms are finding their way to revenues. One of the highest growth sectors in the sample is that of web portals. Skoosh.com is one of the most successful Brighton web portals. Founder Dorian Harris had been working with a wholesaler in the hotel industry and saw the potential in online hotel room booking. Skoosh was set up as a price comparison and booking site with a business model of buying directly from the wholesalers. Large online booking companies instead typically buy directly from the hotels. This meant Skoosh had flexibility in the prices to sell, and the company was rapidly turning over £1.5 million per month as an international business. However in the late 2000s, Skoosh found that many of its American hotel chains were insisting on a fixed price rate as a result of new contracts with the larger companies. This was later adopted by independent European hotels meaning Skoosh's business model was under serious threat, losing 70% of its revenues almost overnight. Skoosh consulted antitrust lawyers and took the case to the Office of Fair Trading, and equivalent offices are now considering it in several other countries including the US, using Skoosh's evidence. The case illustrates how online business models are fiercely contested and how smaller companies may need to contend with larger and more powerful concerns.

While agencies deliberate over the anti-competition case, Dorian Harris has started a new venture, Skoosh Karma, with an innovative new business model. This is again a price comparsion and booking site but with important differences. Working on an invitation only, password protected model the rate parity rule does not apply. However Skoosh Karma is working with principles of the Buddhist concept karma, whereby if a user customer contributes to the site, such as referring a friend, rating a hotel, or leaving a review they will receive an 'Instant Karma' loyalty bonus. Profits are split 50:50 between Skoosh Karma and customers. 10% of each sale goes to a charity of the month, who are then encouraged to promote the site to their supporters. Harris explains:

"My problem was I only had a defunct business model. It wasn't that it was defunct, it was that I didn't know how long this case was going to go on for, if I lost it, I'm stuffed… So I was desperately thinking at the time, well, what new business model could we do that would be a positive change rather than a negative change to the competition?"(Interview 23/07/2013)

This online business model experimentation is partly enforced due to competitive pressures and circumstances, also typical in content sectors. Second Impact is a start up developing online games generally played through aggregator portals. These portals and sponsors are intermediaries that have sprung up in the online space between the content developers and the final user-consumers. Second Impact's experience has been trial-and-error, as they try varying business models that configure the sequence and logic of payments differently. Examples include online games asking for payment up front, or charges at a critical stage in the game, for example when a player makes an achievement and wants to move up a level, or whether gameplay is free subject to extensive advertising banners. All these business models have differing revenue implications for a developer like Second Impact. The sponsors know all the implications and are very aware of the metrics and how much traffic in different world market regions cost. Various options will be offered to the small developer, but without access to this privileged working knowledge. The developer therefore needs to learn the hard way which of these models pays for them.

Both the Skoosh and Second Impact cases show how smaller firms are having to engage with bigger players, learn, defend their position, and be agile and adaptive in moving from one business model to another. In established content product markets, like console video games, the challenge was to move from work-for-hire to self-publishing in order to retain IP and capture more value from sales. Now there is greater variation in the work-for-hire contract for developers to negotiate as an effect of the new technology platforms

The option for self-publishing and the dream of generating IP revenues still remains, and the App Store presents opportunities in principle for any developer, from the legendary 'bedroom coder' to established studios. However our research interviewees have suggested that the level of competition in apps is now daunting, and the business model of giving 30% to Apple, and another potential 30% to a publisher/promoter in the vast majority of cases, leaves little profit for the developer. Many business owners conclude that the relative predictability of work-for-hire is preferential to investing in IP that may not be successful.

One Brighton company that has been successful in earning revenues from its own product on a subscriber basis is Brandwatch. Managing Director Giles Palmer points to the importance of having received external finance from angel investors to give the company the resource to develop their own product. Without such resource small firms struggle to find the time and space to innovate outside of what is required for delivery of their projects for clients. Some manage this through allowing staff time for 'thinking and tinkering', some designate 'R&D' staff, some have 'down tools' weeks to experiment, but the nature of project-based work means breaking the cycle of generating value for other businesses and failing to capture value is a struggle.

Relentless: Innovating across platforms and business models

Relentless Software is a company that managed to move from platform to platform in games and interactive media, and experimented with new business models like self-publishing. Two developers, David Amor and Andrew Eades who started the company had worked for another Brighton developers studio that had closed in 2003. Relentless had a clear strategy to target a wider market than the traditional 'hardcore' gamer market of 15-35 males. It developed a series of products for the Sony Playstation called Buzz!, a game based on 1950s TV quiz shows, a format familiar to a wide sample of the television watching population. Buzz! was intended to be played by families, or mixed groups of young people partying, typically in a living room in the home. The first Buzz! product was a 'slow burner' in sales, eventually selling over a million units[23] and there have been 18 Buzz! games in the franchise subsequently with over 8 million units sold.[24] Buzz! won BAFTA awards for Best Casual and Social Game and Develop Industry Excellence awards for Best New Intellectual Property, and Best Innovation[25].

With all such franchises and series of cultural products, eventually sales begin to decline and there is the need to innovate once again. In 2008, Relentless decided to open an idea generation process in the studio where all staff had the opportunity to pitch new product ideas. This began with a structured process hosted and facilitated by CENTRIM at the University of Brighton. This process urged the studio to think of opportunities to use new technologies, formats and distribution channels that were being introduced to the industry, such as downloadable episodic distribution, user-generated content and motion sensing as with the Wii and Kinect platforms. There was a realisation that there were new business models becoming available in addition to the traditional console publisher-developer division of labour. Relentless were keen to open up a self-publishing line of activity in addition to their work for Sony.

The outcome was a product called Blue Toad Murder Files, which was launched a year later. The traditional game Cluedo influenced the game play and motifs, where players choose among detective characters and follow a narrative to solve puzzles. While the content of the game was inspired by the past, its delivery and execution were exploiting the latest technologies. Blue Toad is distributed through downloads on the Playstation Network in a 'season' of six episodes to date, which were released at bi-monthly intervals initially for £7 per episode[26]. This was a departure from the packaged CDs and controllers of Buzz! that were distributed through conventional high street retailers, which has subsequently become a declining business model with large retail chains struggling to survive. Blue Toad has made over 500,000 unit sales so far, with over 800,000 downloads including free episodes as part of promotions[27]. Most recently, it has been sold on the AppStore, which has again affected another wave of sales and interest.

Importantly, through this project the studio began to learn and become cognisant of the development of smaller game offerings for digital distribution, which is where the social and casual games market has overwhelmingly moved. This entailed new skills and thinking and helped the company to reorient to face the challenges of the new distribution models. Blue Toad was also important as the first self-published intellectual property by Relentless, which led the way to a new independence from Sony.

Since Blue Toad, Relentless has moved further into self-publishing with an app game, Quiz Climber Rivals, which builds on the Buzz! quiz but on the iOS platform. The game is downloaded from the AppStore and integrates with Facebook. The company has shifted its thinking towards bringing promotion and marketing resources in-house on these smaller size games, using social media to raise the profile.

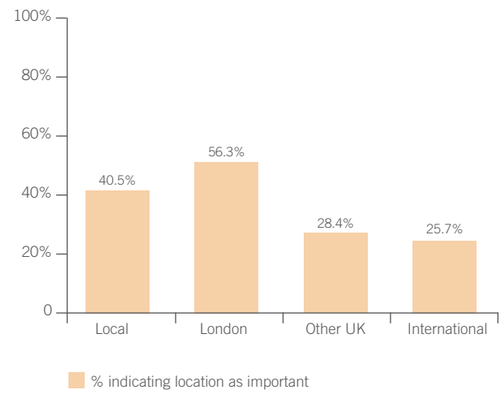
Importantly Relentless has taken another departure by switching to Sony's competitor, Microsoft, on products utilising the Kinect device. These products are examples of the convergence between gaming and television, the latest is Kinect Nat Geo TV, an interactive experience for playful learning in association with National Geographic television, combining motion control and augmented reality. Described not as a game, but as "TV you can watch" the application contains documentary episodic content that also projects the room it is in as a natural habitat on the screen. Viewers/players can act out animal behaviour at home and see it on the screen with themselves as animals. There are also interactive puzzles in addition to the conventional content. Relentless has needed to learn new skills to take advantage of new trends, as well as experiment with new business models and new business partners to maintain a studio that continues to employ around 80 people.

3. London buying

The principal location of clients for Brighton firms is London – more than half (56%) respondents indicate that this is the case. London is particularly important for marketing services, digital agencies and content firms. After London, our respondents trade locally.

Creative goods and crafts firms also trade locally and the same is true for end-consumer and public sector oriented arts organisations. After London and local, there are almost as many firms trading internationally (26%) as with the rest of the UK (28%) – in the case of content, more firms (a third) sell to international clients than to clients in other parts of the UK. The percentage of internationally oriented firms in digital agencies, digital tech and marketing services is also high (between a quarter and a third).

Figure 8: Location of clients (total and by sector)



International orientation appears to be connected to size – larger firms (firms with more than 5 employees) are twice as likely to indicate international clients are important for their business. Cognitive Applications, for example, a larger firm currently at 32 employees, has revamped the website and online collection of the Metropolitan Museum of Art in New York City. Brandwatch has set up offices in New York and Berlin that are now winning work. Large projects for international clients like this likely represent a significant part of the revenues from overseas observed in the survey, but also included would be the voluminous one-off micropayments made through web portals and general e-commerce. Skoosh, for example, had established sites aimed at the French, German and Spanish language markets.

4. Lots of innovation, but not as you know it

Perhaps the appeal of Brighton as a supplier for high profile London clients in media, technology and broadcasting stems from the high levels of innovation we see in the cluster.

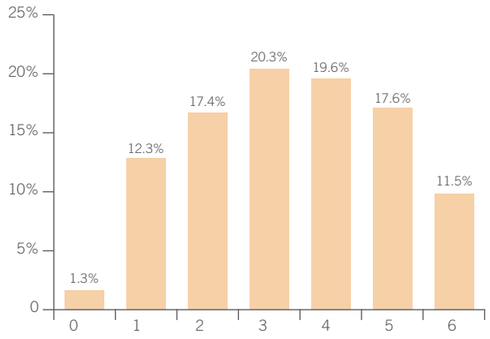
We have developed a typology of innovations in the cluster and measured what firms engage in them. They include:

- New goods and services that are different from the competition
- New processes that make firms more efficient and responsive to customer needs
- New materials eligible for copyright, like a new video game, new film or song
- New software code
- New business models, that is, strategies to generate revenue.
- Staff training – an important type of innovation investment.

We also asked respondents to the Brighton Fuse survey about their use of instruments to protect their IP such as patents, copyrights, trademarks and design rights.

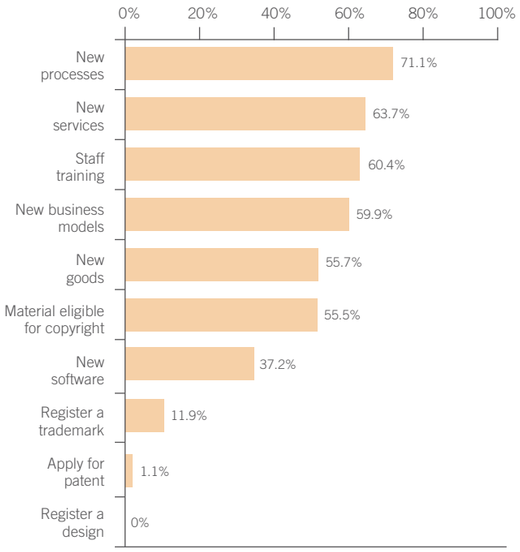
First headline is that the cluster is involved in what appears to be rather high levels of innovation – only 1% of our respondents report not having engaged in at least one modality of innovation between 2010 and 2011. This finding excludes 'materials eligible for copyright' from our definition of innovation. When we look at the levels of innovation by sector, we find that a number of industries including digital technologies, digital agencies, marketing services and web portals display a significant number of firms (between 15% and 20%) that engage in all modes of innovation. The same is true for a full third of larger firms in the sample.

Figure 9: % engagement in x modes of innovation between 2010 and 2011



When we look at the types of innovation taking place in the sample, we find most firms modified their production processes and ways of running the business (71%), introduced new services (61%), trained their staff and changed their business models. More than half of respondents produced materials eligible for copyright, which is striking given the low importance (8%) of royalties as a source of revenue for firms in our sample.

Figure 10: Innovation activities (% who engaged in one between 2010 and 2011)



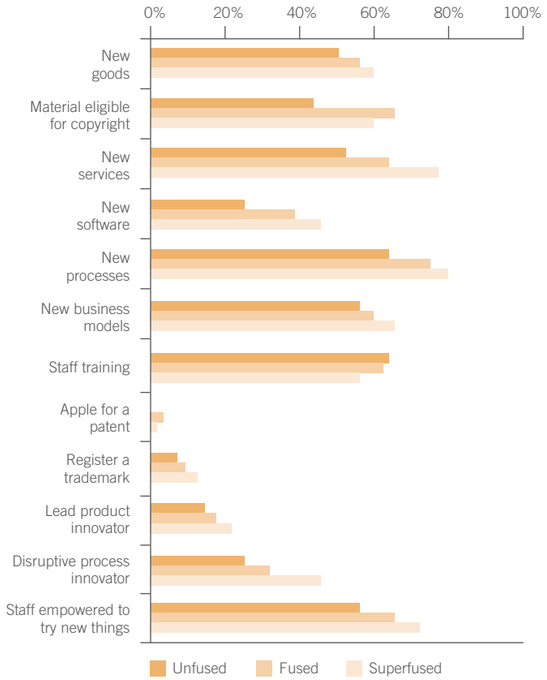
There is also a fundamental divergence between the types of innovation taking place in the cluster and the use of intellectual property rights like patents, trademarks or design rights. Only 1% of our respondents applied for a patent in 2010 and none registered a design. Once again, sector diversity in the cluster is reflected in variation in innovation activities.

We also asked our respondents whether they introduced products and services to the market ahead of the competition and whether they were willing to disrupt their processes – these are measures of the intensity and radical nature of innovation, rather than whether it takes place or not. 17% of firms in the sample agree strongly with the first statement, and a third (35%) with the second.

5. Fusion is connected to higher levels of innovation

Fused and superfused firms innovate across more areas. While only 13% of unfused firms carried out five or six innovations, the proportion of fused firms is 32%, and just over 40% for superfused firms. In other words, 4 in 10 of the superfused firms we surveyed were involved in all the types of innovation we asked them about. We see this across all areas except training. They were also much more likely to launch products and services ahead of competitors, express willingness to disrupt their processes, and empower their staff to try new things.

Figure 11: Innovation activities and fusion (% who reported doing this between 2010 and 2011, or agree with the statement)



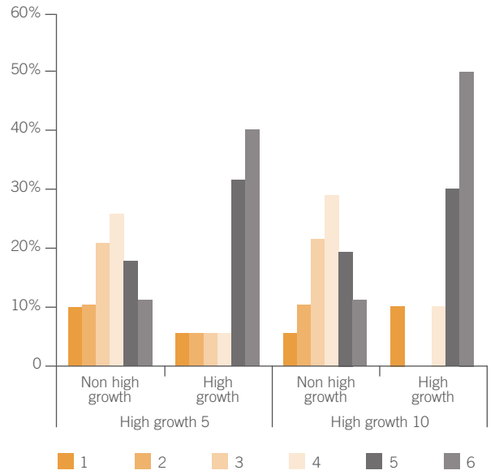
We have found a significant correlation between higher levels of fusion and innovative outcomes (i.e. launching products and services ahead of competitors) after controlling for size, sector, firm age and even levels of growth. Fused innovation is often realised in new forms of service, new interactive content, new interdisciplinary combinations, or the counterintuitive lateral thinking we described earlier in new social media and digital marketing campaigns. These require analytical understanding of the audience/consumer, as well as the communications, media production and aesthetic sensibilities to lure them into engaging. Fused innovation is therefore different from more singular technological trajectories such as increasing the processing power of microchips, or lengthening the life of batteries. It's innovation, but not as we know it.

6. Innovation is critical for growth in the cluster

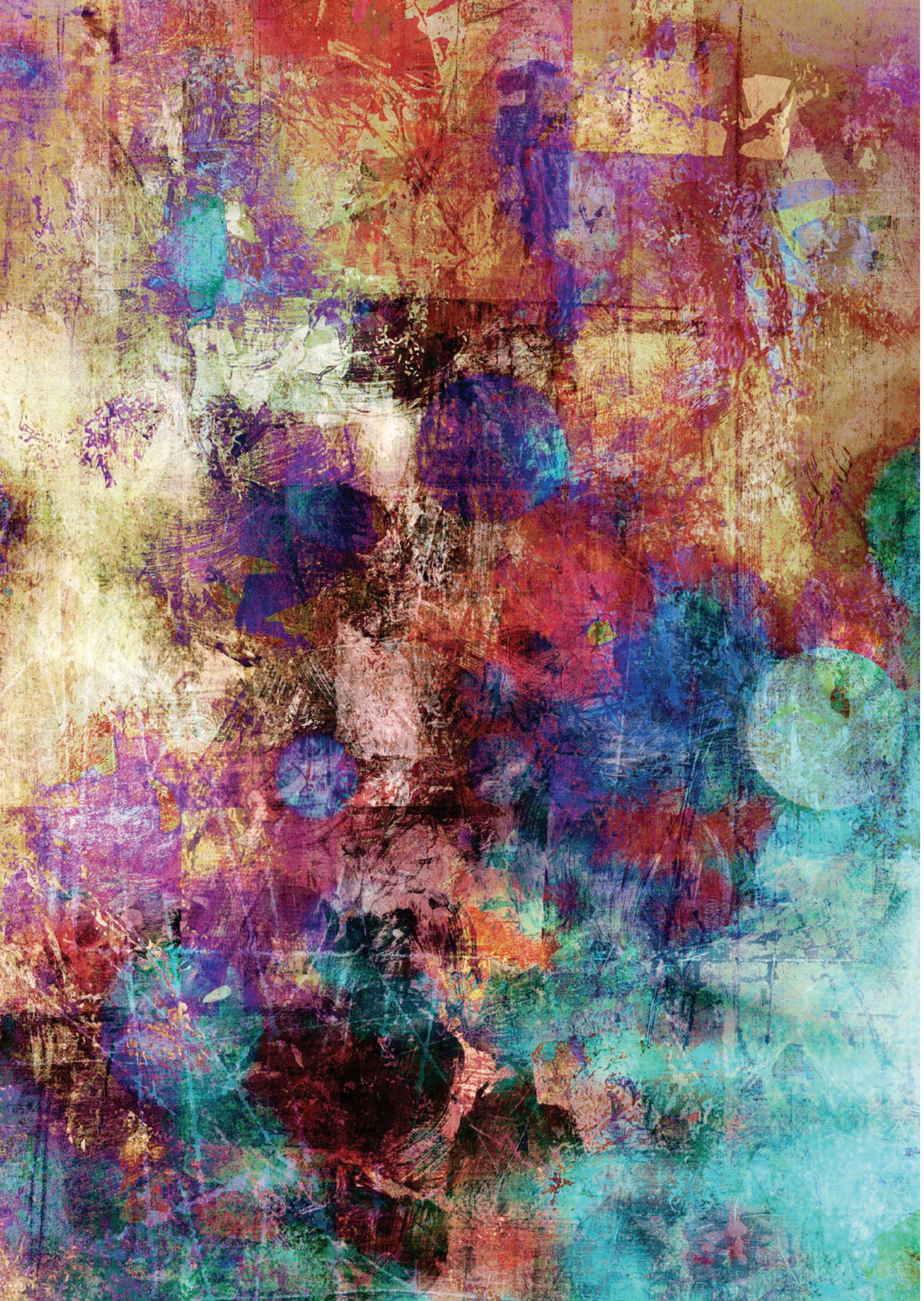
High growth firms in our sample are more likely to improve their processes, adapt their business models, and protect their IP through patents and trademarks (although the overall percentages for patenting remain very small).

High growth firms display a higher propensity to innovate in more areas – 73% of those in the 5 employee threshold (and 80% in the 10 threshold) undertake innovations in five or six of the defined areas - compared with around a third of those who didn't experience high growth. They are twice as likely to say they launch products ahead of their competitors, and 21% more likely to show willingness to disrupt their processes. It is also worth noting that faster growing firms are substantially more likely to say that they have high levels of technological, market and managerial expertise than those who grow less. It is not enough to innovate – innovation has to be well targeted and executed.

Figure 12: Levels of innovation and high growth (% reporting innovation across that number of areas)



We find that more innovative firms are more likely to generate income from royalties or technology licenses – this is consistent with the idea that innovation is a precondition for 'making money in your sleep' through IP. Brandwatch's product is case in point. This is a leading product in its segment based on technology developed internally and attracting revenues through licenses. It is an innovative product, but not in the sense that it was the first and only product of its type. Its continued popularity depends on continued improvement and in particular, the attention paid to user experience and features clients prefer to the competition. These are design as well as technical characteristics: fused innovation.



Brighton's people

In the previous section, we described how the high levels of growth seen in Brighton's digital cluster are connected to its high levels of innovation across a number of areas. But where does this innovation come from, and who generates it? In this section we focus on Brighton's entrepreneurs – who they are, what capabilities they possess, and why they chose to move to the city.

1. A grown-up cluster

Our average survey respondent – the founder, manager or senior staff of a company in the cluster – is 41.7 years old (the median age is 41). The youngest entrepreneur in the sample is 21, the eldest 73. One third of our respondents are in their 30s, one third in their 40s, and 7.8% in their 20s. The Brighton founders are therefore somewhat older than their counterparts in the East London 'Silicon Roundabout' digital cluster, where just under half of interviewees in the Centre for Cities 'A Tale of Tech City' report were in their 30s (many in their late 30s), and a third of the remainder were in their 20s (Demos 2011). Our entrepreneurs are also extremely well-educated: 85% of respondents have studied an undergraduate degree, and 27.4% have a postgraduate qualification (including the 5.7% who hold a PhD).

The success of the Brighton cluster may therefore be, to some extent, linked with the age and levels of experience of its entrepreneurs. One founder of a software solutions studio in Brighton had graduated from Sussex University in the mid-90s with a degree in computer science, but had waited until 2010 to found his own software development studio. He identified the importance of the skills he had developed in the previous decade and a half through working across various digital companies in the city. This dichotomy was particularly apparent when compared to the "highly educated aimless people" who made up his peer group directly after graduation who – himself included – had no real career plans and were drawn into the "path of least resistance" when working in the cluster in the late 1990s (Interview, 16/05/2012). Another founder argued that the evolution of the contemporary cluster into a professional and successful entity was the collective 'growing up' which its members had undergone together:

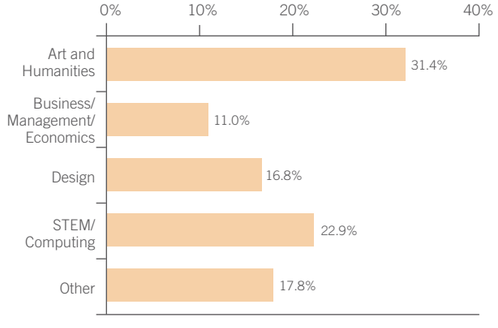
"Going back eight years, ten years, Brighton talked a lot about being a digital hub, but it didn't really deliver. I think over the last few years that's certainly changed and that's because people have grown up down here and helped with people and we've worked together. We actually feel we're doing something now, I think." (Interview 22/05/2012)

Three-quarters of respondents said that 'realising their own ideas' and 'being their own boss' were very important reasons for starting their own firm. Making money was somewhat less key, although still important with just over half describing it as 'very important'. One founder described how he had been spurred to set up his first company after he became frustrated with his former employers equating his salary with his young age (Interview, 29/02/2012).

2. An interdisciplinary cluster

Brighton's fusion is consistent with the diversity of disciplines we see in our respondents. Almost a third of the sample (31.4%) report that they studied an Arts and Humanities subject at university, followed by almost a quarter who studied STEM subjects including computing. 16.5% studied a design subject, including both web design and graphic design.

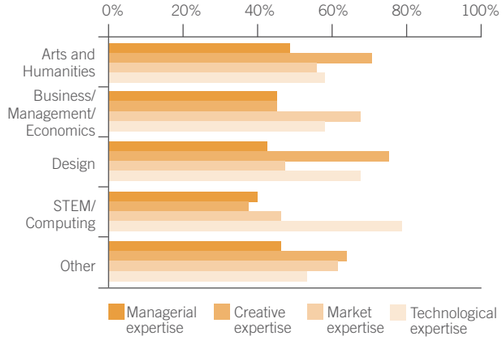
Figure 13: Respondent subject of study



Discipline matters: in Brighton, Arts and Humanities graduates are twice as likely to work in arts organisations as the average respondent. We see similar results with the location of STEM/computing graduates in digital technology firms; with business studies graduates in KIBS; and design graduates in design service firms. Yet degree subject does not wholly drive destiny. Senior positions are held by 7.4% of Arts and Humanities graduates in digital technology companies, and by 17.6% of STEM graduates in content firms. Digital agencies and marketing services firms have founders and senior managers from across a range of disciplines and we see graduates of all backgrounds spread across firms with varying levels of 'fusion'.

This interdisciplinary approach is also reflected in the drivers of competitive advantage identified by our respondents. Although arts and humanities graduates put a stronger emphasis onto artistic and creative expertise, and STEM graduates onto technological facets, both groups recognise 'the other part of fusion'.

Figure 14: Competitive capabilities by discipline background (% indicating as important)



Members of the cluster identify how arts and humanities graduates directly contribute to the innovation and growth in 'fused' firms. A business development director of an digital creative agency, which employed both coders and artists, described how their animators gave her company a competitive edge:

"It's the creative... it's definitely the creative and what sets us apart is beautiful rich artwork. All of our animators actually did their degrees in illustration, so there's that notion of beautiful artwork, very rich artwork, that's then animated. And there's also the notion of narrative and being able to take... whether it's a corporate brand message or whether it's a game for a Nickelodeon or something like that, the ability to be able to create a story around the project and the narrative and the story telling through animation and beautiful visuals." (Interview 16/02/2012).

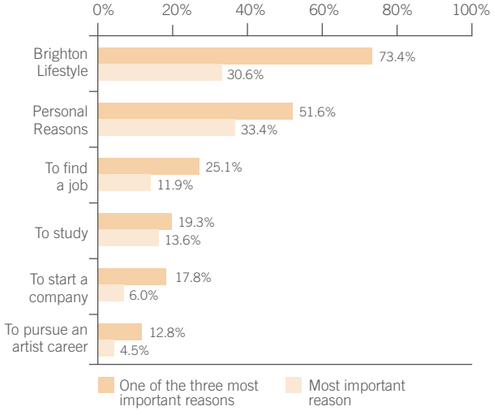
3. A creative diaspora, a Brighton 'lifestyle'

"I knew Brighton quite well. It's got the only vegetarian shoe shop in the country, I think, so I used to come here, every year at least once to buy my shoes." (Founder and Managing Director, web portal company).

The majority of respondents to our survey originally came from outside of Brighton – only 8.5% (41 out of 484) said they have always lived in the city. Our statistical analysis shows, all other things being equal, firms started by entrepreneurs coming from other parts of the UK or the world grow faster. This supports the idea that highly creative and innovative individuals self-select to move to Brighton, and this generates a growth dividend. Yet what is the magnetic appeal of Brighton which allows it to act as such a 'strange attractor' for these creative entrepreneurs?

The Brighton 'lifestyle' is a key reason why our respondents moved to the city, usually combined with some other reason such as personal factors, studying at Brighton or Sussex University, or finding a job.

Figure 15: Reasons for moving to Brighton



One founder of a web development company had moved to Brighton after his wife got a job in Lewes, but was drawn to Brighton by a wider combination of 'lifestyle' and personal reasons:

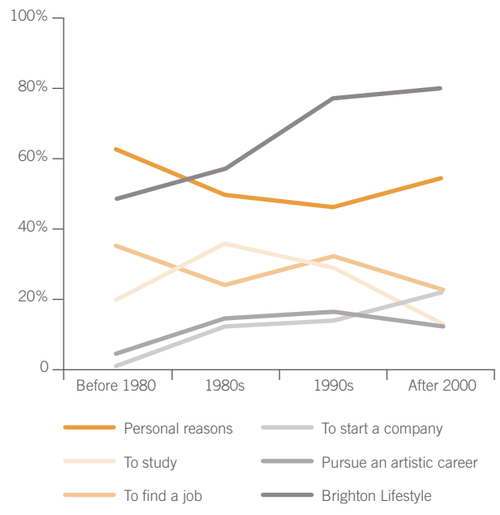
"We'd talked about Brighton for years and we knew people who had lived here and it always felt progressive, ecological and freethinking; that was what we felt. I didn't know anything about the tech scene at all, that wasn't a pull at all because I didn't know about it. But it was the sea and the people and the fresh air and getting out of the big city. But we didn't do anything because we didn't have an excuse, and then she got the job and it was like, right, let's go." (Interview 07/02/2012)

It is rare for founders to move to Brighton primarily to start a company – only 6% of respondents identified this as the main reason for coming to the city, and 'a reason' for just under a fifth. There is some variation across discipline of study and sectors – studying is more important for STEM graduates, with just over 20% mentioning it as the primary reason for moving to Brighton; whilst, understandably, pursuing an artistic career matters more for Arts and Humanities graduates, with almost 10% saying that this was the reason which brought them to the city.

4. Changes over time

Over time it seems that economic factors - finding a job, starting a company – are becoming more important reasons for founders to move to Brighton. When we look at the factors that brought our respondents to Brighton over time, we see that lifestyle has increased in importance whilst personal reasons have become less significant. Also starting a company became more important. Prior to the 1980s, no respondents cited starting a company as a reason to move to Brighton. However, this reason increases substantially over time and more than 20% of those who moved to Brighton in the last period did so to start their own business.

Figure 16: Most important reasons to move to Brighton (top 3) over time



The lifestyle which Brighton afforded continues to remain alluring and, for those moving down from London, the comparatively cheaper cost of property in the city is also an attractive proposition. As the cluster developed its own gravity it drew in more people who specifically moved to the city to found their own company and take advantage of the established network of resources which had now emerged in the space. The founder of a website design agency had moved from London to Brighton with the specific intention of developing his company with his co-founder, and described how the decision was shaped by both work and lifestyle factors:

"Lifestyle was a part of it. Buying a house in London versus buying a house in Brighton costs, but I think I'd just had enough of London, really, commuting. I liked the idea of being able to walk to work, a short-ride to work, and the work-life balance was really up there. But also I'd noticed that there were more professional companies there. I think again the perception I'd had ten, twelve years ago was that it was a bit more guy's bedroom; whereas probably four, five years ago there was a lot more serious companies coming up." (Interview 09/05/2012)

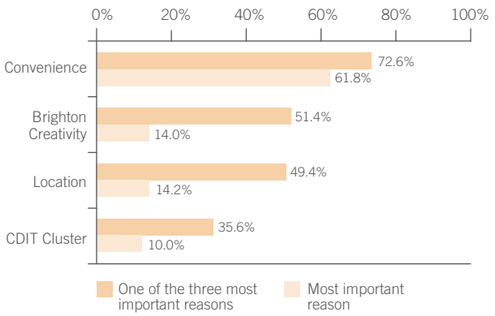
Brighton has thus evolved into a destination for creative entrepreneurs. The first cohort who moved here in the 1990s and early 2000s have created a 'critical mass' which has attracted those with more straightforward economic motivations. For those members who experienced the earlier stage of the cluster's development, the nature of the later-stage dynamics could be something of a shock. One founder had run his own company in Brighton for 3 years in the late 1990s before taking a job in a large corporate IT services company in London. In 2007 he returned to Brighton with the intention of setting up a new technology consultancy company, but found that the business climate had changed considerably in his absence:

"And when I started I just thought, seven years at [IT services company], going back to working in Brighton, I'll clean up! I'll have people begging me to work for them. I knew there would be a lot of people doing digital stuff in Brighton but I just didn't think the competition would be particularly hot. And I found out actually very quickly it wasn't so much that Brighton didn't have competition, it actually had some really decent established businesses that were doing world-leading stuff." (Interview 24/02/2012)

There is some suggestion of a lag between coming to Brighton and starting a firm. This is consistent with the notion that most of our respondents were not originally intending to start a business when they moved here – the average age at which they moved to Brighton is almost 28, whilst the average age at which they founded the current firm is 35 (although this may not be the first firm they founded during this period).

So what makes our respondents decide to start a company in the city? The most important reason both as a first choice, and in the top three of all choices, is convenience. This is followed by Brighton's reputation as a creative place, its location - near to London - and several reasons related to creative clustering including the presence of a skilled workforce, industry networks, and clients.

Figure 17: Reasons for starting a company in Brighton (only founders)



The 'soft' nature of Brighton's reputation as a creative city thus produces 'hard' economic benefits for the companies based here, attracting talented workers and also feeding into the competitive facets of firms' outputs. The business development manager of a digital creative agency, for example, argued that:

"I think quite often you get a type of person living in Brighton for a start. For instance, people tend to be quite creative, people tend to be very open minded and liberal, and we're renowned for that. That's certainly something I share in common with most of the people I've worked with in the years I've worked in Brighton. So I think that is at the very heart of our business, but in terms of actual business practices, yes, of course because we're first and foremost a creative company." (Interview 16/02/2012)

These soft factors, when combined with the critical mass of the cluster itself and Brighton's own hard factors – proximity to London, transport infrastructure – create a unique and powerful mix.

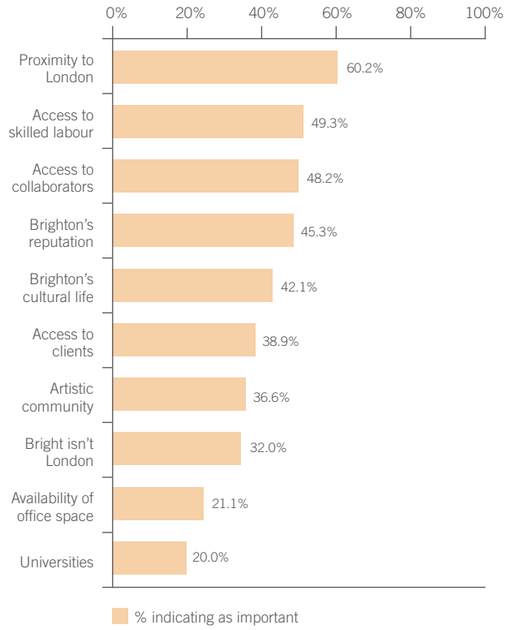
Critical mass

In the previous section we explored the 'long game' of the Brighton cluster: the motivations for would-be founders to move to the city and start companies. In this section we now examine the qualities of Brighton today which create advantages for these firms and identify the facets of collaboration, networking and knowledge-exchange which drive 'fusion' growth and innovation. Whilst these factors provide benefits for firms in the cluster, they may also be extremely difficult to imitate, and we consider suitable policy recommendations.

1. Geography

The geography of Brighton - in particular relation to London but also Gatwick airport - is a hard factor, and provides a critical advantage for Brighton firms. Proximity to London was mentioned most often by our survey respondents when asked which Brighton factor helps their businesses to grow, perhaps unsurprisingly given it reflects our earlier findings about the principal location of Brighton firms' clients. Whilst some companies elect to have London 'outposts' – often very small or shared office premises – for many, the trip to London is short and manageable enough to be done regularly to suffice for visits alone. One founder referred to the train to London as the 'money train' (Interview, 29/02/2012). Similarly, one respondent noted that the one-hour London-to-Brighton rail journey between the two cities was equivalent to travelling across London from the Old Street tech cluster to the BBC headquarters in White City, West London. The journey also works in reverse. Brighton is an attractive city to visit, and several founders described how they drew on the city's reputation to attract London clients down to visit, particularly during the Brighton Festival in May, and over the later summer months.

Figure 18: Factors related to Brighton that represent an advantage



2. Ambience and communities

Brighton's proximity to London is not unique, nor is it the sole cause of firms' success – many other towns and cities are positioned close to the capital, yet do not host high-growth creative and digital clusters. Instead, there is a second tier of factors which also shapes both the critical mass of talent and collaborators present in Brighton, and the city's reputation and cultural life. As alluded to earlier, Brighton embodies what one founder described as the Brighton 'brand' of "great weekends…a city of creative people whether it's journalists or musicians, artists; the Brighton Festival, the slightly bohemian and alternative aspect to the brand." (Interview 29/02/2012) which is attractive to visiting clients, but also provides advantages for founders and their companies. This distinct reputation and identity of Brighton, the lifestyle that it affords founders and the specific means by which it affects the capabilities of firms is key: nearly a third of our survey respondents agreed that the fact that Brighton is not London works to their advantage. One Managing Director described:

"London's vibrant but it's competitive… No one really trusts each other and it can get quite dirty, whereas I'm friends with people who run competitive businesses in Brighton and we'll quite openly chat. I don't think you'd get that anywhere else either." (Interview, 23/08/2013)

The presence of a thriving arts and cultural scene in Brighton does not benefit all firms equally. The presence of the digital cluster doesn't necessarily benefit arts organisations in particular. The larger and faster growing firms are less likely to mention Brighton's artistic community as an advantage for them.

These responses support the argument that Brighton firms thrive on their proximity to others like them as well as others that are different, and the communities and institutions that drive the city's cultural life. Yet the city is not an interdisciplinary melting pot. Boundary spanning institutions and activities such as the Brighton Digital Festival and Wired Sussex play a role in ensuring a healthy flow of information through the different, and potentially fractious parts of Brighton's creative ecosystem.

The Brighton/Cherokee Nation Digital Cultural Exchange

The Brighton/Cherokee Nation Digital Cultural Exchange was a highly ambitious, year- long pilot project led by Wired Sussex and primarily involving two secondary schools in Brighton and three counterpart schools in The Cherokee Nation, Oklahoma, USA. The project vision of exploring how digital media could enhance the way cultural exchange takes place was successful in forging positive connections, collaboration and co-creation between participating institutions, and significantly, resulted in the first formal commitment to teaching Cherokee history outside of the Cherokee Nation. Andrew Sikora, the project coordinator on the US side reflected on Hove's Blatchington Mill School's adoption of Cherokee history into their year nine curriculum using Skype based interactive learning sessions:

"It is going to impact, possibly, a part of the generation in a way that has never been done in two hundred years, and I think that this is also an interesting outcome of this project... out of the art and technology we have a totally different cultural outcome." (Interview, 17/06/2013)

Whilst many institutional challenges were faced in terms of the slow pace of adopting new technologies due to school policies and procedures, pupils and teachers engaged with each other via Skype and Edmodo both inside and outside of school premises, including creative learning events at the American Express Community Stadium in Brighton and at the Sallis Benny Theatre, University of Brighton. In addition, both UK and Cherokee artists and University of Brighton MA students actively collaborated to generate a series of learning experiences that "don't happen in an average year", according to one of the participating UK teachers. The culmination of the project was the co-creation of a Cherokee-inspired float for the Brighton Festival Children's Parade in May 2013. MA Digital Media students from the University of Brighton supported pupils from all of the schools in co-creating flags which adorned the float.

A loosely-coupled network involving many stakeholders with small-scale funding for artists and events proved successful in forging relationships that gave rise to formal knowledge exchange and tacit learning, particularly in the use of new software tools for sharing local and popular culture for the participating pupils. For the UK teachers too, pupils and teachers gave positive feedback on the use of technologies to connect, collaborate and co-create. One Cherokee teacher described the experience of learning about world war two from UK pupils via Skype as the highlight of her teaching career. Phil Beckwith, Lead Professional for humanities at Blatchington Mill School, gained the confidence and ability to go beyond the text book and connect live to his area of professional passion - Native American History.

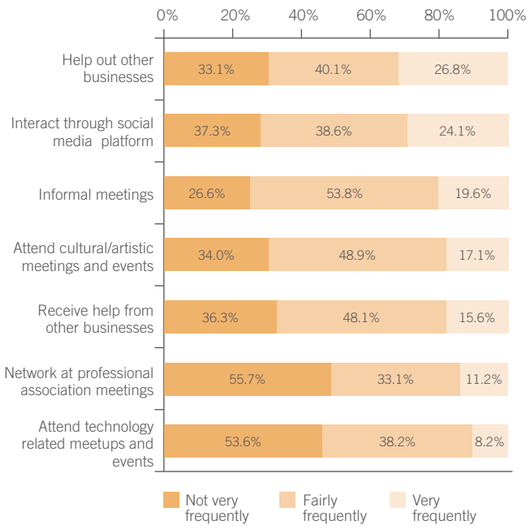
3. Local networking and collaboration

One component of the Brighton ambience described by respondents is an atmosphere of friendliness, openness and connectivity, where people are willing to share support and knowledge. These experiences are held out by our survey responses: just over 2/3rds of respondents say that they help other firms in the cluster frequently or very frequently and a similar percentage (64%) say they receive help from others. This mutual support is also stressed in the qualitative research. Ian Elwick is an entrepreneur and intermediary who has been active in the cluster since its an early phase in the 1990s, he has opened several co-working spaces, such as the Brighton Media Centre and more recently The Werks, and argues that help and physical clustering are key:

"So that's not rocket science; it's the fundamental principle of peer support and applied support that we've brought in and physical collocation. Those three things together, have been the thing that's helped people to survive and grow their businesses. I mean, that's the story that I really want to put out, because a lot of people don't appreciate that. They think that they can do just as well by, you know, having a backroom kind of shop or something. But, it is this kind of networking and mutual support that makes an enormous difference." (Interview, 17/09/2012)

Interestingly however, Elwick also notes there is a tendency for what may be called microclustering, in that practitioners in the five Werks co-working facilities tend to prefer to interact within their highly localised network and five Werks are less inclined to do so with those in the other buildings. This may partly be convenience but also may be due to the orientation of these communities: one is creative-digital, another centred on social enterprise, another artistic. We have found that the fusion effect does not naturally and automatically occur at the cluster level, even if it does in co-ordinated projects in businesses, individual co-working spaces, and events like festivals. Networking occurs intensely within communities, but less so across businesses, individual co-working spaces, and events like festivals.

Figure 19: Networking and knowledge exchange activities carried out by respondents



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An extensive networking scene exists in the city, which drive these interactions. Activities range from formal 'meet-ups', such as the monthly Open Coffee Sussex meeting for tech entrepreneurs and investors, to informal meetings and catch-ups, supported by the small size of the city and a plethora of coffee-shops and pubs, to more 'involved' types of collaboration where businesses help each other out. The connectivity afforded by social media also complements this networking without replacing the critical face-to-face element of it; Twitter in particular has supported both day-to-day chatter and the generation of buzz around social events as well as provide transparency about proximity. To "see which pubs people were going to after work" (Interview 28/08/2012), for example.

Yet these networking activities do not drive firms in the Brighton cluster to link up together to form a single massive cross-discipline super-connected community. Instead different sectors and different types of companies interact in different ways, which shapes their access to knowledge and capacity for innovation. Arts organisations and content providers are more likely to attend cultural and artistic and events, such the Glug meet-up which was introduced to Brighton to create the physical connection between the freelancers who made up much of the creative sector and who would otherwise be 'sat at home on our own, tapping away'; and to 'be inspired' (Interview 01/03/2012). Conversely, founders of digital technology firms attend more technology-related meet-ups and events, such as the frequent meets associated with specific programming languages including the twice-monthly JavaScript meetup, Async.

Bridging organisations can also help to facilitate collaborations. The membership organisation, Wired Sussex, organises frequent networking events in both Brighton and other parts of Sussex. There is a positive association between Wired Sussex membership and networking and collaboration, with members significantly more likely to say that they help (and are helped) by others, than those who are not. Co-working spaces including The Skiff and The Werks also facilitate interactions between companies, both by providing space where members work in close proximity and through offering free hosting for many networking events.

This culture of help combined with intense, if variegated, networking can provide a collaborative advantage for firms in the digital cluster. The founder of a content production company described how the 'Brighton way' was one of sharing resources which for them included offering freelance consulting work to companies that might otherwise be considered their competitors, and borrowing expensive technical equipment for shoots with the proviso of "It's fine, just make sure you bring it back" (Interview 16/02/2012). This resource sharing, the founder argued, allowed his company to "punch above its weight", transforming them from just "three guys in an empty office" to a business which had delivered high-level award-

winning large projects to major media clients including Sky, Channel 4 and the BBC.

Networks and contacts are more useful for fused and superfused businesses than unfused ones. Superfused companies in particular, find that these networking processes are useful for socialising and feeling part of a community. The founders of an animation studio whose work combines artistic elements with the technical facets of motion graphics, had developed connections with a wide network of peers through networking events and participation in festivals such as White Night. The company aimed to eventually move into a larger studio space so that they could offer desks to freelancers whose skills complemented their own – sound designers, coders, script-writers – which would allow the firm to develop and expand their work offerings:

"It means that A, in our downtime we can create more well-rounded projects to try different things, and B, it means when those pitches come through and it's like well, ok, here's an iPhone app and so we have no idea how to make an iPhone app, you can say 'Well come on, let's join forces and lets actually pitch for this. Rather than say 'oh, we don't do that, try these guys' we can actually say 'No, we'll give it a go'". (Interview 27/02/2012)

Fused firms therefore derive several specific advantages from networking. One of the animation studio's founders described how the relationships provided a sense of local community despite the fact that they didn't really have a 'fit' within the Brighton digital ecology. It also gave them the confidence to take on client work outside of their current skills base as they knew who to turn to support gaps in their capabilities. The founders of a post-production company which also combines creative and digital activities, described how by attending the Brighton Animators Networking Group (BANG), an event which had little to do with the firms' core business capabilities, they were able to develop connections with new collaborators. Even if these relationships were initially non-commercial in nature – for example, resulting in developing an offering for one of the festivals – they were important for "expanding the web". However, setting up the relationships in the first place could be challenging as there was a tendency for similar groups of designers or programmers to cluster together:

"There's little factions of people and they don't necessarily all mix together. I think people get quite comfortable in Brighton because they've got their own little circle. Not in a "No-one else is allowed in" type way, but they have no real need to expand their group after they've got their clients and their network of support. So it's difficult sometimes to find a place where that gets a bit messed up, where everyone can get a real different group together rather than it being a couple of groups all very similar. We're always odd ones out cause there's not big groups of people who do what we do, because we're very specialist so it's not like we can go in with the designers or in with someone else. We're always on the periphery in that sort of way." (Interview, 01/02/2012).

However, local networking does not add equal value for all firms in the Brighton cluster. There appears to be a negative correlation between engagement in networking activities and innovation and growth. One interpretation for this is that firms which grow more quickly are more visible and capable of attracting collaborators. These faster growing, more productive firms are more likely to conduct knowledge exchange activities and less likely to engage in business networking. The founder of a social media agency described how, as an established member of the Brighton digital community, he felt less need to "go to every event, talking to the same people….I know that there's an email or phone somewhere or Tweets where I can contact them and they know who I am" (Interview 22/05/2012) – once the initial relationships had been set up and reputations built, companies were more able to move beyond the interim spaces of collective networking events to focus on specific projects with collaborators. Similarly, the founder of a large media agency described his engagement with Brighton networking in terms of the lobbying power which a community of firms could bring, particularly through his position on the Wired Sussex Board, rather than through orchestrated events.

Black Rock and the Black Pebbles: how networking in the cluster leads to business resurgence

Black Rock was a video games development studio originally called Climax Racing, specialising in the racing games genre. It was perhaps the first games studio in Brighton, originally financed in 1999 by Climax, a studio still operating in Portsmouth. Climax Racing grew quickly with a number of successful products and was acquired by Disney Interactive in 2006, becoming Black Rock. It went on to develop two highly acclaimed innovative games, which nevertheless did not sell to Disney's expectations. Various explanations have been given for these disappointing sales, some argue that the Disney brand with its family connotations is a disadvantage when promoting products aimed at young men, such as racing games. Product launch timing also was argued to be unfortunate, since the second product was competing with the launch of a hugely anticipated new title from RockStar Games, perhaps the leading studio for sales worldwide. The Black Rock studio was closed in 2011 with 144 staff made redundant.

Since the closure of Black Rock, many of its people were recruited by other studios elsewhere in the UK as well as by large studios in Canada. However a large proportion wanted to stay within the Brighton cluster and those interested in forming new businesses mobilised a group called the Brighton Indie Collective, which was active on Facebook as well as through fortnightly meetings in pubs. Accountants, lawyers and business development advisors were invited to the pub meetings to help programmers, artists and producers become entrepreneurs. 15 companies have started-up from the Black Rock talent pool, which are named the 'Black Pebbles' by the Black Rock Managing Director, Tony Beckwith, who has created one of the new companies, Gobo Games. This is the only Black Pebble developing for the console platform, most of the others are small, with 2-5 employees and are developing games aimed at the iOS app or Facebook markets. A few are experimenting with different types of products and business models; Trailer Farm produces video trailers for games; Second Impact develops web browser games and Origami Blue produces learning aids for kids with learning difficulties, and was recently acquired by Mind Candy, an online games developer aimed at the kids market which has successfully diversified into material goods like toys and books.

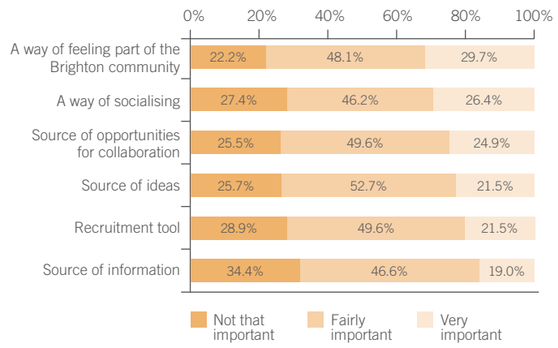
Mind Candy is based in the Shoreditch cluster of East London and sees Origami Blue as a blue sky R&D operation for their business, encouraging the three man team to continue to be based in Brighton "away from the mothership".

These cases illustrate how the cluster comprises resources and resilience against the volatility of the sector. The response to the Black Rock closure in mobilising channels of information and knowledge for those wishing to start-up was a collective response. This continues, for example, with passing on requests for work-for-hire among the collective and continuing advice and support on issues such as finding suitable office space. As some of the Black Pebbles are pioneering into new business models the rules of engagement are not initially clear and they are learning rapidly, about how to structure contracts with online intermediaries and terms of payment. These insights and learning points are shared among the network through individual contacts. The cluster learns, holds and exchanges the knowledge by referral. In a volatile sector where business has been disrupted and the centre of gravity moved from consoles to the smartphones, web and TV platforms, clustering is a way to adapt and survive.

4. Brighton networks are multipurpose and multiplex

Engaging with local networks and contacts enabled our survey respondents to meet many different aims. As mentioned earlier, they build trust and facilitate a sense of belonging in the Brighton community – something which 30% of respondents said was very important to them. Networks also allow people to socialise. The compact size of the centre of Brighton meant people often serendipitously ran into each other and were also able to easily attend events after work which were often within walking distance of their workplaces. Identifying new opportunities for collaboration and recruitment was facilitated, both through digital and online means - calls for freelance work spread quickly across Twitter and the older Brighton New Media mailing list – and new ideas and information could also be accessed across the community. Between a fourth and a fifth of respondents highlighted the importance of these different motivations for networking.

Figure 20: Use of networks and contacts



There are however variations in the purpose of networks for different industries. 52% of arts organisations and 37% of creative goods and crafts firms emphasise the importance of the community-building aspects of networks. These facets are less important for marketing services (17%) and content firms (28%) who use their networks to identify opportunities for collaboration. In general, fused firms tend to put a stronger emphasis on the importance of local networks as a source of benefits, both economic and otherwise.

As the data above indicates, there is not always a clear line between the economic and social functions of these networks. This is partly a function of Brighton itself which provides a space where many of the social networking activities are constructed around the prevalent leisure infrastructures which Brighton and its surrounds provide; good coffee shops, pubs and wine-bars in the city, as well as the sports and physical activities afforded by the seafront and surrounding Downs, including cycling and beach volleyball. However, the 'lifestyle' choices made by founders who move to the city can encompass the desire to put down roots, as the director of a digital strategy firm explained:

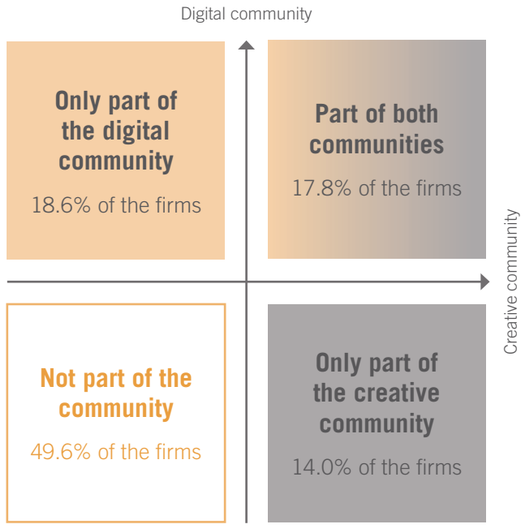
"I think that if you're here then you're probably thinking you're going to be here for quite a long time…So most people have made a fairly conscious decision this is the place for them and they're a Brightonian, whereas in London what I've experienced is people being on a much shorter cycle of time". (Interview 15/03/2012)

When combined with the comparatively small size of the city, this can create facets of an "always on" culture – people are not only likely to run into each other in town during working hours but also at weekends and at the school gates, and know that they will continue to see each other for the longer term. Work associates can also be part of the same parent-teacher association or walking group. These tight-knit social networks of the 'same faces' therefore form across personal and professional lifespaces of blurred identities, transmitting social and cultural capital between the two. This can facilitate resource sharing and the capacity for rapid organisation of formal and informal projects, but can also create frictions when the personal and professional do not align. The analyst for a social media company described how tensions emerged when the company's CEO and one of their clients both participated in the same local sports team during a time when the firm-client relationship was difficult.

5. Fragmentation between Brighton's digital and creative communities

Almost half of the founder that we surveyed do not strongly identify as either part of the creative or the digital community. The other half is evenly distributed between the digital community (18.6%), the creative community (14%) and both together (17.8%). As we'd expect, this fragmentation occurs across sectors. The overwhelming majority of arts organisations participate exclusively in arts communities, and the opposite is true for digital technologies. Superfused groups are much more likely to say they are integrated into both groups.

Figure 21: A sense of belonging to Brighton creative communities



Several Brighton organisations have developed strategies to overcome this fragmentation. The arts-focused digital culture agency Lighthouse deliberately extended its audience outreach from a solely artistic audience to include more members with technology and digital backgrounds, and were also instrumental in re-forming the Brighton Digital Festival in 2011 as a means of integrating the two communities. The organisation also strategically hosts several other organisations in the creative industries within its office suite, including user experience agency, Clearleft; Culture24, a cultural digital publishers; the web design agency, Liquid Light; the digital agency, MindOrchard; and SouthEast Dance, a dance development organisation. This co-location has enabled the arts organisations to mingle with their design and technology counterparts in the communal space between the offices, and at Lighthouse events. Collaborative work has also emerged out of this proximity such as the Brighton Digital Festival.

However, breaks between the arts and digital sectors are also shaped by resource gaps which can lead to further attrition between the networks. The founder of a brand strategy firm described how this prevented the company from taking on more arts clients:

"When we started out [we] had quite a broad portfolio of artists' work and it was one of our key targets. But I think what we found was the budgets were tiny and the expectations massive, it was just difficult. So I think what's happening now is we're picking up one or two pieces but they tend to be funded projects." (Interview, 20/03/2012)

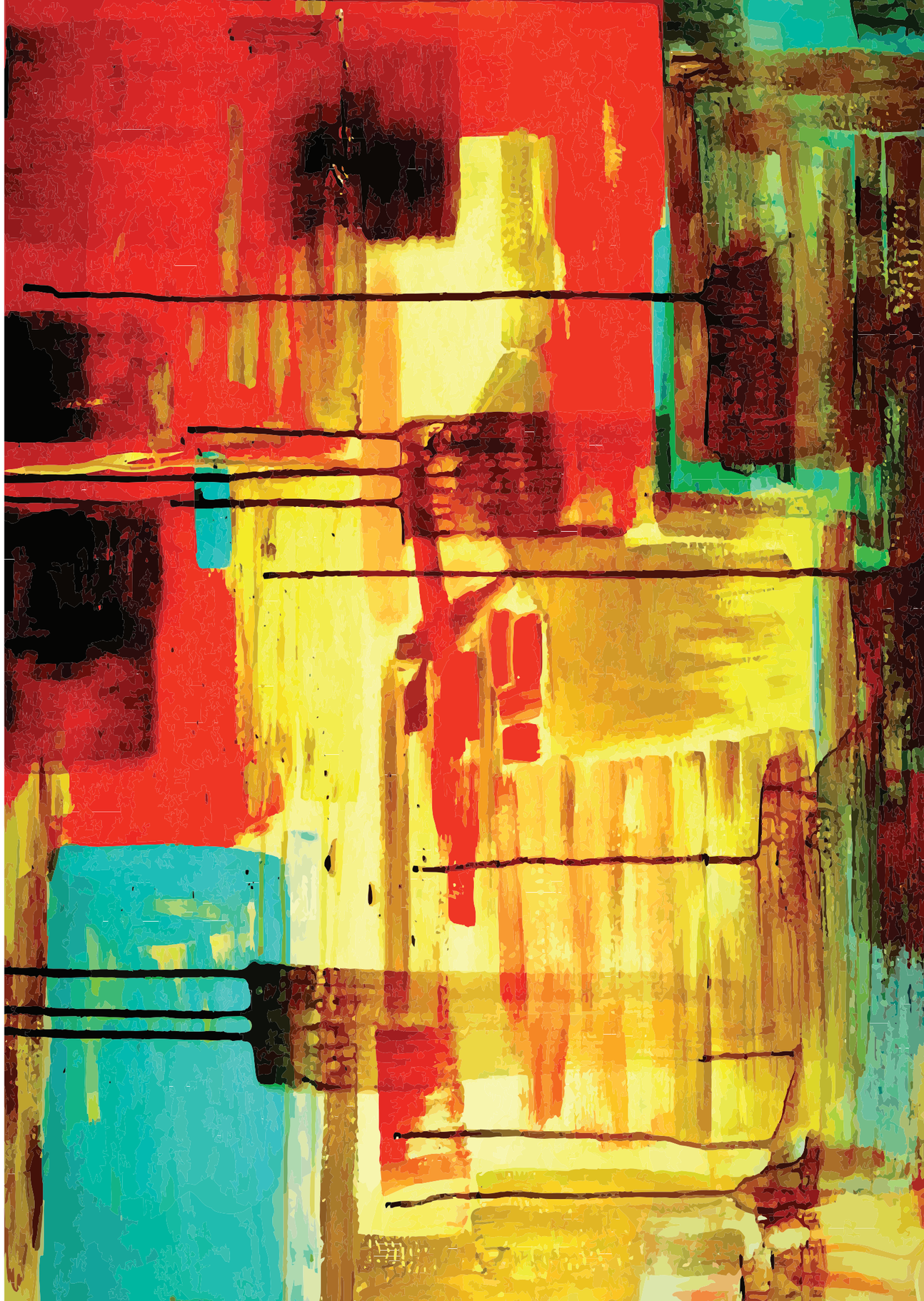
6. Universities

Universities are often mentioned as a key factor in the birth and development of clusters, usually through the spin-outs and knowledge spillovers they generate. In line with the previous studies that highlighted the 'widget-less' nature of knowledge exchange in the creative industries, our data suggests the two universities located in the city – Brighton and Sussex – may be impacting on the cluster through indirect channels that are softer and often related to skills. As 'studying in Brighton' is an important reason why founders move to the city, universities can play a key role in attracting future creative digital entrepreneurs to the cluster. Mike Hollingbery of BozBoz followed a media studies degree at the University of Brighton before becoming a founder managing director of his creative digital agency, he found that learning mass communications models prepared him for the explosion of social media years later.

Universities also purchase goods and services from local digital agencies, 18% of which identify universities as an important client, as well as from marketing services firms (15%) and arts organisations (13%). Interestingly, we find that the group of firms which trade with universities tend to be more innovative. The reasons behind this are unclear, it may be the universities choose to work with more innovative providers or the correlation may simply be an artefact of sectoral difference.

We also see very high levels of engagement between universities and local firms. In 2011, over half (56%) of respondents engaged with universities in some way. The most engaged sector is arts organisations (74%) whilst web portals are the least engaged at just over a third. When we examine the type of engagement taking place, we see that the dominant channel is informal networking, carried out by a third of firms in our sample. This is followed by the use of facilities, and placement schemes such as those offered in Brighton University's 'Fashion with Business Studies' BA and MDes degrees which have placed 3rd year students in local firms like the bespoke tailors Gresham Blake. 10% of surveyed firms collaborate with universities on research projects. For example, a mobile app company works with a computer science lecturer when developing a game for a museum, wherein the company developed the software and the lecturer conducted user testing trials. Finally, only 6% make use of the universities to train their staff. Interestingly, there is no IP licensing to speak of.

The number and means of channels of engagement through which organisations engage with the local universities has a significant effect on innovation activity. This suggests that, all other things being equal, the organisations which engage more with universities tend to be more innovative. We have also found that the higher growth firms have significantly higher levels of engagement with universities. iCrossing, for example, has conducted joint research with natural language researchers at University of Brighton to help with linguistic profiling as the scientific analysis helps with product development (Interview, 31/07/2013).



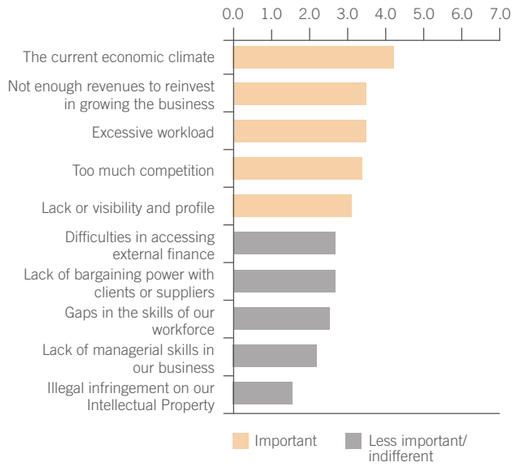
Barriers to growth

The previous section described a dynamic, creative and growing cluster. However, Brighton CDIT firms are not immune to risks and difficulties. Several factors may affect the firms in the cluster, and impede or hamper their growth.

1. The current economic situation, lack of revenues, resources and profile are the main barriers faced by our respondents.

We asked respondents to classify a list of ten barriers that could potentially hinder their business. Figure 22 ranks these barriers to growth by their importance. The barriers in the orange area are those considered the most important, while those in grey are less important or indifferent to the respondents.

Figure 22: Barriers to growth ranking



On average, Brighton CDIT firms rate the current economic climate the most important barrier hindering their growth possibilities, followed by not enough revenues to reinvest, excessive workload, too much competition, and lack of visibility. An example of this is the apps market, one online developer explained: “It seems to be the thing with the App Store is that it’s like 10% how good your game is and 90% marketing, because there’s just a flood of apps and information. Getting noticed is the key.” (Interview, 11/07/2012). The other kinds of barriers are, on average considered, less problematic by the respondents.

Quite interestingly, copyright infringement is considered the least important barrier. However, this is not too surprising if we consider that more than 50% of the firms introduced new material eligible for copyright, but only 8% of them identified royalties as an important source of revenue.

This picture reflects the average perceptions. However, respondents have been quite specialised in their answers, rating only a few barriers as important at the same time, and showing much less concern for the other ones. Out of ten kinds of barriers, 78% of the firms declared that two barriers or less were important for them, while only 22% faced three barriers or more as important.

Moreover, we found that some barriers were correlated with each other, and we carried out factor analysis to reduce the number of barriers to a more

manageable number of components. The analysis shows that three kinds of factors could statistically summarise the barriers to growth:

- Economic and financial barriers ('Money'),
- Barriers related to higher levels of competition, lack of visibility and bargaining power ('Market'),
- Barriers related to skills and managerial gaps and high workload ('Mastery').

Figure 23: Classification of barriers to growth into factors

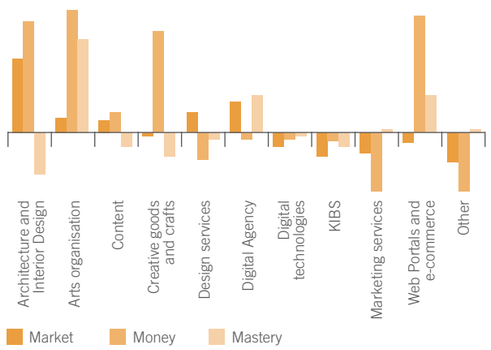
	Factors		
Barriers	**Money**	**Mastery**	**Market**
Difficulties in accessing external finanice	✔		
The current economic climate	✔		
Not enough revenues to reinvest in growing the business	✔		
Gaps in the skills in our business		✔	
Lack of management skills in our business		✔	
Exessive workload		✔	
Too much competition in our markets			✔
Lack of visibility and profile			✔
Lack of bargaining power with clients or suppliers			✔

2. Skills and managerial gaps are important for high growth, innovative and fused firms

The previous sections described how differentiated Brighton's CDIT sector is in terms of activities, business models, firm's characteristics, levels of fusion and so on. Therefore, it would be very unusual for these firms to face these barriers to growth in the same way. The three factors created above will allow to check whether different categories of firms (e.g. by sector, by size, by fuse, etc.) are experiencing different kinds of barriers.

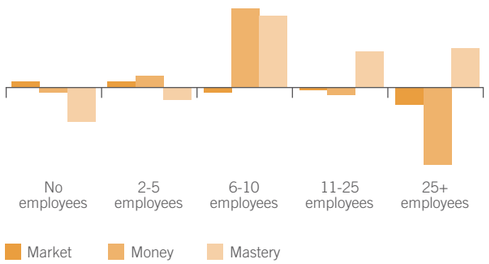
Figure 24 shows CDIT sectors are not homogeneous in terms of barriers to growth. The horizontal line of the graph represents the average perception of that particular barrier. A bar above the line denotes that the barrier is having a more serious impact on that particular category of firm. On the contrary, a bar below the line denotes that the barrier is considered less important by that category of firms.

Figure 24: Barriers to growth and sector distribution



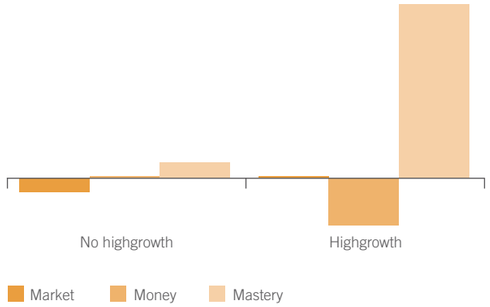
In particular, the most creative and artistic sectors, such as architecture and interior design, arts organisations, creative goods and crafts, plus web portals and e-commerce, are those that are facing barriers to growth more than average. Also content, design services and digital agencies are facing barriers to growth, but less significantly. Other sectors, such as KIBS, digital technologies, and marketing services perceive these barriers as less important than the average. With only a few exceptions, the main differences between sectors regards the Money barriers, with the creative and artistic sectors (plus web portals) facing these kind of barriers more significantly than others. Interestingly, arts organisations are the only sector that suffers all kinds of barriers more than the average.

Figure 25: Barriers to growth and size



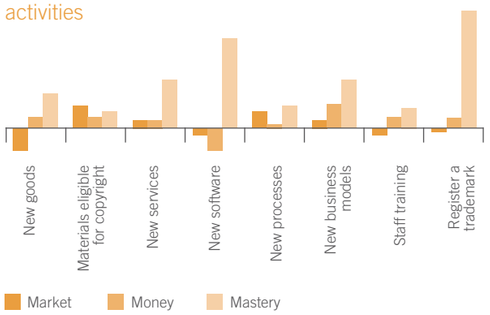
It seems that there is a relationship between firm's size in terms of employees and barriers to growth, with larger firms facing **Mastery** barriers more intensively than the small firms. All the firms with 6 employees or more, representing one quarter of the sample are in fact experiencing this kind of barrier more than the average. In particular, firms with 6 employees or more are five times more likely to experience skills gaps and twice more likely to have managerial skills gaps than firms with 5 employees or less.

Figure 26: Barriers to growth and high growth firms (only firms with more than 5 employees)



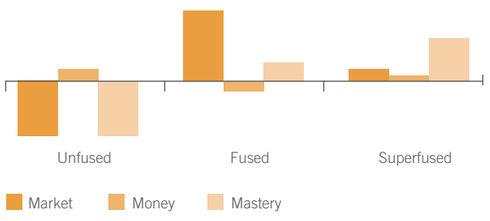
We find that also high growth firms face Mastery barriers more than the average. Even if we consider that our definition of high growth firm only includes firms with more than 5 employees - which are already facing **Mastery** barriers more than average - we see that for high firms Mastery barriers are even more important. Also, quite interestingly, high growth firms do not confront with **Money** and **Market** difficulties more than the average.

Figure 27: Barriers to growth and innovation activities



If we look at the relationship between barriers to growth and innovation, we see that regardless of the kind of innovation activity undertaken, innovative firms always face skills and managerial barriers **(Mastery).**

Figure 28: Barriers to growth and level of fusion



Being fused emerged as a crucial success factor to grow and survive in the cluster. Both fused and superfused firms perceive **Market** and **Mastery** barriers as more serious than the average. However, **Mastery** barriers are more significant than **Market** ones for superfused firms and vice versa for fused firms.

One of the barriers that emerge as the most critical is **Mastery**. This does not indicate that the Brighton CDIT cluster is not affected by the economic crisis. On the contrary, as shown by figure 22, this kind of factor is still, on average, the most important.

However, **Mastery** barriers are those that are relatively more important for certain categories of firms. In particular, those firms which are faster growing, more innovative, and fused are more likely to face skills shortages (there is no talent for them to hire) than access to finance (lack of resources to invest) or market barriers (poor visibility, etc.). The director of a high growth firm reported that:

"If we wanted to double the team in Brighton, we couldn't. There aren't another 40 people that I would hire in Brighton that I could get hold of within a year. It would take that long. You would have to look very hard and we'd probably find ten, 20, maybe 30. It's incredibly difficult to scale the business here, whereas in London much easier." (Interview, 31/08/2013)

This is consistent with the idea that those firms that innovate and grow will be attractive propositions for investors, and will be able to differentiate themselves in the marketplace. The challenge is to supply them with talented 'fused' employees, and with the management skills they need to continue adapting and innovating in response to changes in technologies and demand. The low use of university training services perhaps indicates a missed opportunity in this respect.

www.brightonfuse.com

The BIMM Model and the FuseBox

What started as an inquiry into creative learning models and a desire to pilot new learning experiences for the CDIT sector companies, exploded into a 3000sq ft learning space providing an intensive and transformative learning experience, via the FuseBoxAmp pilot for early stage entrepreneurs.

The journey started with Wired Sussex's Phil Jones drawing inspiration from a local learning institution that has achieved international recognition for delivering music education for musicians. A privately funded higher-education institution, the Brighton Institute of Modern Music combines both formal teaching with informal learning experiences as students are actively encouraged to form bands and gig locally as part of their overall education. Having grown successfully in Brighton due to the conducive nature of the local cultural scene and availability of venues, BIMM has evolved a model that has been replicated in other cities, Bristol, Dublin and Manchester.

Wenger's concept of Communities of Practice inspires and underpins the BIMM teaching and learning model. Using both individual and group assessment techniques, BIMM has produced many successful artists who have recognised the role of the institution in their development and as a consequence maintain their relationship beyond that of alumni, contributing their experience on practical levels. Tutors are drawn from the music industry and have successfully blended with the formal academic sector in order to accredit their BA courses and innovatively, developed their own PGCert for Teaching in partnership with Middlesex University.

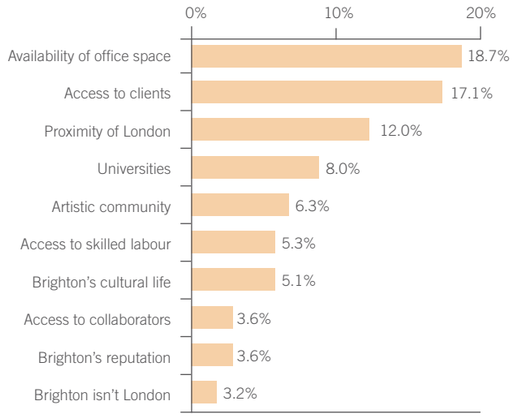
Wired Sussex and Brighton and Hove City Council successfully gained EU funding through the Recreate urban regeneration programme in 2012 to establish what has become a CDIT sector focused learning space at New England House in Brighton. In summer 2013, the FuseBoxAmp opened it's doors to ten Brighton-based entrepreneurs for a month-long pilot project, trialling new ways of delivering business support. Drawing on learnings from BIMM, London's School of Communication Arts and other international creative learning institutions such as dSchool at Stanford University, HyperIsland and Kaos Pilots, the FuseBoxAmp successfully engaged local business mentors. Three modes of learning were successfully trialled through

supported activities for individuals to focus on their projects, with peer-to-peer support and through support from CDIT sector expertise via the mentors. Led by Tom Nixon, himself a local CDIT sector, business owner, the learning focus was on personal and professional development described by Tom as combination of "inner and outer learning". Whilst still very much a work in progress, the FuseBox has already gathered significant momentum and importantly, legitimacy amongst the CDIT sector.

3. Lack of office space is the main barrier to growth locally

The barriers to growth described so far are considered at a general level, and they refer to the entire economic system or to specific business characteristics. We also asked respondents to evaluate what local factors are identified as barriers. We found that lack of office space is mentioned most often as a hindrance, followed by problems accessing clients, proximity to London, universities and, interestingly, the artistic community (which is however largely outnumbered by the respondents who find the artistic community as a relevant local resource).

Figure 29: Local barriers to growth (% identifying a factor as barrier)



We should mention that, on average, none of these factors are perceived as a problem. On the contrary, many of them are considered as an important advantage (see figure 18). The only local factor which people find an advantage (21.1%) and others perceive as a problem (18.7%) is office space. One entrepreneur commented:

"Office space in Brighton is ridiculously expensive for the quality. It's just off the scale. This office costs us 24 quid a square foot. We get an office nicer than this in the heart of Manhattan for roughly the same price, in the heart of Manhattan!" (Interview, 31/08/2013).

This suggests availability of office space could represent a physical barrier to growth, which is even more relevant for those businesses growing faster. High growth firms within the five employee threshold are almost twice as likely as those which are not high growth to identify office space as a barrier for them (45.5% compared to 27%). The percentage of high growth firms with more than ten employees identifying office space as a problem is even higher (53.3% of them do).

One puzzling result was a perception of the artistic community as a barrier by some business owners. In some cases this was substantial: 15% of marketing services firms, and 21% of firms with more than 25 employees had this negative view of the local artistic community. The qualitative research leads us to believe that this view is rooted in a suspicion of the 'bohemian' lifestyle of artists and creative people. Many of the Managing Directors of firms referred to a mix of creativity, lifestyle and a desire for an 'easy life' rather than a hard work ethic. This is seen as the downside of Brighton's creativity and seaside quality of life:

"There's a bit of a lifestyle thing about Brighton sometimes... people are kind of here to have an easy life rather than to work hard and that can be quite frustrating." (Interview, 01/08/2013).

"Culture is a strength in some ways because it's creative, but there's a kind of slightly easy life thing that goes on in Brighton. People move here for the lifestyle. As such, they're not as focused on work as, this is a massive generalisation, but in general, as some people in London." (Interview, 30/07/2013).

"I also identified… there was a high degree of concentration of young creatives, mainly from universities and a strength in bohemian, kind of, artist-type industries…And the problem with that is that, if I'm being frank with you, occasionally, they're a bit lazy…Perhaps, it's, maybe, a bit too laid back occasionally, for it's own good, if you look at it in a business sense." (Interview, 10/07/2013)

These attitudes are not restricted to Brighton. The UK's small firms are popularly seen as being more motivated by achieving a stable lifestyle than driving on towards higher growth. Artists are often caricatured as undisciplined and unconcerned about business objectives. To a degree this is borne out by our research in that we found less marketing competence in artistic organisations and different styles of behaviour in terms of raising income, such as reliance on grants, and less 'fused' knowledge. This illustrates another contradiction in the fused mix, that although people recognise the critical importance of art and design and research has traditionally shown creative workers need a degree of autonomy away from management control - managers still get frustrated with the artistic community and see it as a barrier to growth.

Conclusions and policy recommendations

As the previous chapters have shown, the Brighton Fuse project has generated a number of surprising and informative insights that advance our understanding of the processes of collective innovation in a modern, dynamic industrial cluster. The Brighton Fuse project builds on previous research on geographic clusters and digital creative industries using high quality qualitative and quantitative data that capture a significant number of firms and institutions in the cluster.

In this final chapter, we will highlight key findings and discuss their general implications for our understanding of digital industrial clusters, in order to generate specific recommendations from the data.

1. The arts and humanities and interdisciplinary interactions are a key source of innovation and economic growth

The single most important finding from the project is to highlight the economic importance of arts and humanities (A&H) as sources of innovation and economic growth. While this has been suggested before, this project provides solid evidence about just how important the arts and humanities are to innovation in a UK sector. Moreover, it shows how A&H skills can lead to significant economic growth when fused with technical STEM skills. As the data shows, some 45% of entrepreneurs in the cluster have an A&H background, including entrepreneurs behind some of the most successful firms. Moreover, fused and superfused firms that integrated A&H with technical STEM skills performed very strongly, generating growth rates of 14.7% in the middle of a major economic recession.

The clear implication of these findings is that we should move away from thinking that the arts and humanities are a luxury subsidised by the economic growth generated by natural sciences and engineering. The arts and humanities are part of the engine of the UK economy, not an optional aesthetic detail on the upholstery. Arts and humanities feed into improved design and better design helps products and services do their job better. The majority of innovation in the UK is service based and therefore is likely to draw on design, process innovations, software and softer organisational and marketing changes rather than just R&D. While the arts and humanities enhance our culture and quality of life, they also support an innovative, dynamic service economy and should be recognised as such.

The second key finding from the project is to show the economic value that comes from

interdisciplinary integration. The fused and superfused firms that integrated creative A&H skills with creative technical skills had superior economic performance compared to firms that didn't integrate as extensively. These findings are consistent with a broad body of knowledge highlighting the importance of knowledge integration. This integration occurred despite most systems of education, training, research and career development being very discipline based. The university research system, for example, is currently evaluated in ways that penalise interdisciplinary work. Clearly, interdisciplinary and disciplinary approaches are complements rather than alternatives and the qualitative research highlighted how a strong Arts & Humanities background could provide the basis for interdisciplinary collaboration. At the same time, it showed how difficult it is for firms to effectively encourage interdisciplinary integration.

Part of the problem is that people live and socialise in unfused professional, disciplinary and social communities. When these different cultures are brought together, it often exposes cultural mismatches rather than creative opportunities. Firms have to actively manage and encourage this integration and force it to work in projects. Outside work, events and creative spaces such as the Brighton Digital Festival are also important in bringing these unfused communities together. Given this fusion generates significant economic benefits, a question arises about why all firms don't do it: the qualitative research suggests the reason for this is it is difficult, it requires a lot of work, and real interdisciplinary skills are in very short supply.

The problems of fitting interdisciplinary, inter-sector innovative work into a world structured by sectors and disciplines are illustrated during the Fuse survey. Approximately half the firms that self-report to be in digital creative economy are outside the traditional SIC codes used to capture them. These findings support the current attempts to reformulate industrial categories and redefine SIC codes, but go further. Economic growth is driven by innovation, which requires integrating wider and wider sources of knowledge. Improving SIC codes and classifications is a step in the right direction, but the Fuse analysis suggests the economy is constantly changing so, however accurate current SIC codes are, future innovation is likely to cut across them. Kinds of firms, kinds of skills, kinds of knowledge and kinds of innovation can no longer be meaningfully classified together in single categories for very long. Digital innovations don't just rely on digital skills, and people with digital skills don't just work in digital firms and sectors.

2. Clusters and the geography of place

The importance of interdisciplinary work in the Brighton creative and digital cluster reflects the complex and extensive division of labour that exists in modern economies. As Adam Smith highlighted, as the economy grows and markets expand the division of labour is extended and jobs become more specialised. Importantly, he highlighted this occurs within organisations and between organisations as well as at the level of individual work tasks, so knowledge itself becomes both more specialised. The increased specialisation of both work and the knowledge that goes into it means the co-ordinating role of linking specialised work together becomes relatively more important, which is one reason why there are benefits from having fused skills.

These changes in the economy have geographic implications. When the economist Alfred Marshall was writing about industrial districts at the end of the 19th century, he was writing about a time when the division of labour was relatively under-developed, and geographic and knowledge specialisation overlapped. As a result, industrial knowledge could be 'in the air'. Within a local environment people could move from firm to firm, diffusing knowledge as they went, because the jobs they did would be very similar in each firm.

The way local clusters, such as the Brighton creative and digital cluster, develop and grow today underscores how different the modern world is. The increasing complexity of modern goods and services means they require more extensive inputs of specialised knowledge. This has organisational implications and generates a more interconnected economy, subject to learning effects, increasing returns and co-ordination problems, all operating at different geographic scales. Rather than regional agglomeration occurring because of knowledge spill-overs between firms producing the same goods with the same knowledge, in modern economies products and services change rapidly. As a result, economic benefits come from being able to innovate, which requires the generation and integration of new knowledge. As Jane Jacobs highlighted, this means firms can experience significant advantages if they operate within a rich and diverse local economy.

The Brighton creative and digital cluster is perhaps an extreme example of this type of economic activity. Digital creative products and services often change fast in response to shifting customer tastes and requirements. Such products and services are often generated within temporary projects that combine knowledge from inside the firm with the knowledge and skills of external suppliers and contractors. Firms in this sector benefit from having a critical mass of skilled local suppliers and freelance contractors who can add specific skills to projects that the firms themselves cannot economically justify having in house. Hence an important strength of the local cluster relates to its ability to update and improve a widely distributed body of knowledge. This, in turn, benefits from the diversity and depth of the local sector, which allows knowledge and experience to be reused across projects and accumulated. This has led to cluster-level economies of scale and improvements in knowledge and knowledge integration that firms in the cluster can exploit and benefit from.

The history of the Brighton creative and digital cluster highlights how this cluster-level advantage

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was developed through a complex process that exploited different features of the local economic environment at different points in time. These local advantages often drew on specific features of the local environment, such as a local artistic style or the digital festival. However, many of the advantages are generic and provide broader lessons that can be used to enhance the specific local features of other environments.

What we don't see in Brighton is the emergence of a Schumpeterian-Marshallian regional agglomeration where a new innovator comes up with a new product, enters the market and rapidly generates economies of scale in production. This would lead them to generate superior profits that attract follower firms to the cluster, who help generate local knowledge spill-overs between firms. This model of cluster formation is widely found in the academic literature, but must be used carefully as it can justify almost any government policy intervention.

Instead, we see a process where economic actors working on existing kinds of products, that are constantly innovating, were attracted to Brighton for a range of economic and non-economic reasons. Importantly, a key attraction related to the quality of life, compared to London, which reflects both local Brighton features and much lower relative housing prices. Lower housing prices in turn reflected local weaknesses in the Brighton economy at the time. This is an important point. It is relative weaknesses as well as relative strengths that influence the growth of clusters and these change over time. Today's advantages can be tomorrow's barriers and vice versa. The growth of a small number of core firms, strongly linked to London and international markets provided work for the nascent cluster, which exploited a range of local mechanisms to build the capabilities to generate creative digital products and services. Over time as the cluster matured it became increasingly diverse which gave it the ability to adapt to changes in technologies and markets. While firms came and went, the skills being accumulated within the local economy developed and could be reused. Over time firms developed the ability to generate value and also capture value in ways that both benefit the innovative firms and also benefit the wider cluster.

The growth of the Brighton creative and digital cluster was therefore very organic. It exploited a mixture of hard-headed entrepreneurial talent with a strong focus on performance and a range of softer, more cultural features of the local environment. It is not a Silicon Valley-style story of constant success, as the history of the cluster is one of set-backs and failures as much as successes. Firms were born, grew, succeeded, but then also sometimes failed. But when failures did occur, the cluster had sufficient diversity to reabsorb and re-exploit the talent that had been freed up, often channelling it in new entrepreneurial directions. For example, the large number of "Black Pebble" firms that emerged from Black Rock.

It is important to note that this dynamic process has strengths but also significant weaknesses.

The wages of many arts and humanities graduates remain low and many people working in the cluster have several jobs through necessity rather than choice. We find firms that are growing strongly, but as of yet we have not seen the emergence of very large global firms of the sort found in Silicon Valley. Brighton is an example of local regional success rather than Californian global conquest, and is all the more representative and informative for that. Silicon Valley is interesting because it is atypical, which means it is likely to be unlike what is happening in the rest of the world.

The growth of the Brighton cluster on the other hand offers a number of insights for public policy. It suggests that while talented people and innovative firms can be attracted by local benefits, that on its own isn't enough to generate a cluster. This should caution against zero-sum policies that attempt to build clusters by attracting talent from other parts of the country, through policies like tax-breaks or subsidies. This often simply moves talent around at considerable economic costs without helping the pool of talent to grow. In effect, such policies reflect a wealth transfer from the poor to the rich, without improving overall performance.

Nor does the growth of Brighton provide much support for notions that clusters can be created from scratch, particularly in highly innovative industries like biotechnology, nanotechnology, or graphene, if firms do not have strong commercial links. Having strong local demand, in this case initially from London, was vital for the emergence of the Brighton cluster. Without demand, expensive science-push style policies that generate technological value, without much thought for how that value will be captured and commercialised, are likely to be ineffective, much like pushing on a piece of string.

The experiences of Brighton suggest existing features of a local economic environment become attractive at particular points in time, in ways that are probably impossible for policy makers to predict in advance. Brighton was lucky in being able to attract talent and had a range of venues and events that could provide a setting for networking and collaboration. Once in place, groups of firms can then build up from what they have and take advantage of the available freelance talent, arts and cultural amenities, and universities and colleges, until a critical mass of firms is in place for contracting and collaborating. This, in turn, generated a stronger local capability to produce and innovate.

The development of local knowledge occurred within formal and informal settings. Universities provided talent, and importantly, the foundation of an ability to learn over the employee's lifetime. Within a cluster there is also a need to address long-term talent improvement, which the survey highlights as a major constraint on growth. In Brighton we see 'aggregator organisations' emerging to generate economies of scale in this talent development. Similar organisations have been found in other areas with large concentrations of

firms in the creative digital industries. In television production, the BBC often plays a similar role.

These organisations play an important co-ordinating role in addressing the numerous constraints on the growth of the Brighton creative and digital cluster. These constraints on growth were highlighted in the survey as relating to Money (specifically the current economic situation, and firms lacking profits for reinvestment), Market (specifically lack of skills and an excessive workload), and Mastery (which related to the firms profile, competition in its markets, and its lack of bargaining power). The key issues driving and constraining growth in the cluster are therefore not just related to firms being able to create value for customers, they also relate to their ability to capture that value in ways that lead to economic development and growth for the firm and for the cluster.

3. Value capture vs. value creation

The third main conclusion relates to the importance of mechanisms for value capture, rather than just value creation. There has been a lot of focus in the policy and academic literature on the importance of innovation and how well firms and local regions generate value. The qualitative work highlights how firms capture value is just as important. If firms and local regions cannot capture a large enough proportion of the value that they generate, then they may find it more difficult to grow, develop and generate profits. Moreover, firms with the ability to capture value can also utilise value created elsewhere or by others.

The research highlighted the performance of firms in the cluster was highly skewed. Like most clusters, the Brighton creative and digital cluster was characterised by a large number of small firms and contractors working with a smaller number of larger firms. These larger, firms were typically able to capture more of the value they generated for their clients because they possessed what are called 'complementary assets'. These complementary assets include things like intellectual property protection, well recognised brands, production facilities, complementary service offerings, more significant market power, better bargaining positions and links to customers. How firms create and capture value together makes up their business model. Both parts are equally important, yet public policy focuses on the value creation part and often overlooks the importance of value capture.

The qualitative research also highlighted a number of important mechanisms for capturing value for the entire cluster through agglomeration and increased diversity. Various institutions were developed to allow learning at the individual, firm and collective levels. Firms in the cluster exploited the Brighton brand, and the diversity of the firms in the local environment allowed firms in the cluster to exploit more complex production processes than would be available to them if they weren't in the cluster.

The importance of clusters developing the institution and firm-based assets to capture value highlights an important trade off. On the one hand, if firms have an ability to capture value then they have more incentive to innovate. On the other hand, reducing firms' ability to capture value can encourage a wider diffusion of innovation and knowledge. There are potentially significant benefits from allowing value to diffuse, particularly if the value is non-rival and can be reused at no or little economic cost. Information, knowledge and many cultural goods have this property. Indeed some of these goods can, in some circumstances, increase in value the more they are diffused and modified. There is therefore a trade off between having value-capture mechanisms in place to provide incentives for innovation and allowing the widespread diffusion and utilisation of the value that is created.

Interestingly, we do not find that traditional methods of value capture, such as IPR are particularly important among the firms we surveyed. They typically rely on other mechanisms to capture value, by building brands and reputations for producing high quality innovative work, for example. This increases firms bargaining positions with their customers, brings additional work to the cluster and can lower transaction costs.

At the cluster level, we find similar mechanisms that allow value to be captured for the benefit of the local region. The brand Brighton has for its creative industry cluster attracts new talent and reduces search costs. The various interactions between firms in the cluster and the local arts festivals help showcase material and enrich the social networks that are so important for economic activity in this distributed, project based industry.

Clearly important policy questions remain about when and where to cross-subsidise and where to allow individuals, firms and regions to capture the majority of the value that is created. In Brighton, there seems to have been a particularly effective division of labour that combines hard-headed entrepreneurial focus on capturing economic value in a small number of firms, with a strongly socialised ethos of sharing in other creative areas. Some of the weaknesses in the cluster may reflect an inappropriate balance at work. For example, universities can find it difficult to capture economic value from research and training because of the imperfect nature of markets for knowledge. In economic terms, providing training for free and capturing value through improvements in reputation which enable other profit making activities might be better.

4. Building clusters elsewhere

What lessons does the Brighton experience have for other regions of the UK? Many studies focus on highly successful clusters in exceptional places and atypical industries. Understanding what drives the performance of Silicon Valley, the Los Angeles film industry, or the City of London is interesting, but the implications of what goes on in such atypical regions for normal regions are hard to draw. Brighton is a more typical case that can provide more appropriate lessons. It is a success but still has problems. It has grown, but still has unrealised potential. And it has advantages, but also disadvantages. Moreover, it

shows how disadvantages can turn into advantages and vice versa. In this regard, it is more like other potential clusters than the atypical clusters that are often studied. Needless to say, most regions don't have a Stanford University to draw on.

The lessons of Brighton are:

1. It is very difficult to create artificial clusters from nothing, but policy can be helpful later on

Rather than starting from scratch, the Brighton cluster emerged from existing technology which was developed to create and capture value by entrepreneurial firms exploiting local advantages that often reflected disadvantages in other areas, and that changed through time. Once established, the cluster developed through improvements in the labour market, skill upgrading, increasing the diversity of production (which allowed knowledge to be reused), and through the creation of specific institutions that helped aggregate demand and co-ordinate collective action.

The Brighton creative and digital cluster wasn't therefore created by Government policy but once up and running, the experiences of Brighton suggest government policy can have a positive effect. Local agencies may not be able to seed clusters but they can build on what they have. We don't find much evidence that top down policies were adopted, but we do find support for bottom up initiatives to support local firms was effective.

As the cluster and the firms in it develop, new constraints appear and interventions can be effective in removing them. Currently, these relate to the extent and quality of the digital infrastructure, constraints on office space in Brighton, changes in demand, and continuous learning and upgrading of skills to address a perceived talent gap. Because of the project- based nature of much of the work in the cluster, many of the skills needed to innovate are outside the firm. Firms in the cluster benefit from a 'thicker' market for talent, which creates knowledge 'spill overs' and a multiplier effect - with knowledge developed in one project being reused in others - in ways not possible in an area without the concentration of firms, the diversity of activity or the co-ordination provided by aggregator organisations. In these sorts of situations, policy works particularly well if 'aggregator organisations' articulate bottom-up concerns and work with policy makers to address them.

2. Cluster development is a dynamic mix of hard-nosed economics and softer cultural and institutional support

The evolution of the Brighton cluster highlights the complexity of the relationships between firms, local agencies and the environment. In contrast to what some may expect, the entrepreneurs and managers in Brighton are often very commercially focused. The combination of entrepreneurial drive and industrial experience so important to the development of the Brighton creative and digital cluster is something unlikely to be created by local or national policy.

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However, the firms also exploited non-economic features of the local context in ways that added to its richness. The evolution of the cluster was complex, with strong networks forming between local firms, some of whom then built links to the wider global economy. Economic success from exploiting local cost advantages gradually changed into exploiting local innovative capabilities as labour markets improved, connections between firms were established and knowledge was developed and integrated. This economic activity often built on and complemented non-economic activity.

3. Creating interdisciplinary integration is difficult but can be done

The fused nature of the Brighton creative and digital cluster - the way that the arts and humanities are integrated with digital technology - is at the heart of its success. Fused and superfused firms performed much better than unfused firms and the highly innovative, successful firms at the core of the cluster that provided many of the links to national and international markets were particularly interdisciplinary.

This integration of different kinds of knowledge, often from different cultures, is difficult and doesn't happen naturally. The history of the cluster highlights a number of staged interventions that provided creative spaces to encourage the fusion of knowledge so important to the success of the cluster. However, these attempts at integration are not always successful and often reveal cultural mismatches. The project found people are, and remain, unfused in the communities they live in outside work. To integrate them, firms use projects and the cluster has exploited events like the festivals. Universities can clearly play a role in this integration, but some firms in the survey expressed concern about how much they helped.

Integrating knowledge for its own sake will fail to generate economic value. Brighton was successful by aligning non-economic activity that enhanced integration with economic activity benefiting from integration in ways that boosted the entire cluster.

These lessons are general enough they can be applied in a range of contexts. The experiences of Brighton offer rich lessons for finding new approaches to support economic development in ways that exploit local advantages and respond dynamically as advantages at one point in time become barriers later on. Ways of creating value and capturing value, in economic and non-economic settings, can be made to combine in ways that enhance each other. Arts and Humanities and technical subjects, value capture and value creation, advantages and disadvantages, public and private, hard-headed entrepreneurialism and softer, and even rebellious, cultural values enhance each other by being fused. This is the lesson of Brighton.

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[28] Principal Component Analysis with Promax oblique rotation. IP infringement has been excluded because it was too poorly correlated with the other items.

[29] With cross sectional survey data there is a possibility that this correlation is reflecting statistical endogeneity rather than causality. For example, the relationship could be driven by higher performing firms using their higher profits to pay for interdisciplinary knowledge integration, even though this has no impact on performance. This is unlikely as we would intuitively expect weaker, not better performing, firms to be wasting resources on pointless activity. Moreover, there is a strong and robust research base showing the economic value of knowledge integration. While some of the effect may be driven by endogeneity, the effects are large enough that we can be reasonably confident the findings are robust.

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